

VOLUME 7

PART 5

NORTH AMERICAN FLORA

(UREDINALES)

AECIDIACEAE (continuatio)

JOSEPH CHARLES ARTHUR

DICAEOMA ON POACEAE (continuatio)

JOSEPH CHARLES ARTHUR AND FRED. DENTON FROMME

DICAEOMA ON CAREX

JOSEPH CHARLES ARTHUR AND FRANK DUNN KERN



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ANNOUNCEMENT

NORTH AMERICAN FLORA is designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago, and Curaçao and other islands off the north coast of Venezuela, whose flora is essentially South American.

The work will be published in parts at irregular intervals, by the New York Botanical Garden, through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence:

Volume 1. Myxomycetes, Schizophyta.

Volumes 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 34. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Dr. N. L. Britton, Dr. W. A. Merrill, and Dr. J. H. Barnhart.

Professor John M. Coulter, of the University of Chicago; Mr. Frederick V. Coville, of the United States Department of Agriculture; and Professor William Trelease, of the University of Illinois, have consented to act as an advisory committee.

Each author will be wholly responsible for his own contributions, being restricted only by the general style adopted for the work, which must vary somewhat in the treatment of diverse groups.

The subscription price is fixed at \$1.50 for each part; it is expected that four or five parts will be required for each volume. A limited number of separate parts will be sold at \$2.00 each. Address:

THE NEW YORK BOTANICAL GARDEN

BRONX PARK

NEW YORK CITY

Triticum polonicum L., Manitoba.

Triticum Spelta L., Minnesota, Missouri, Oklahoma, Texas.

TYPE LOCALITY: France, on *Clematis vitalba*.

DISTRIBUTION: Widely and abundantly distributed throughout the temperate region of North America, and less abundantly both northward and southward; also in Europe, Asia, and Australia; coextensive with the cultivation of wheat.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^o: f. 254, 255, 257a, b, c; McAlpine, Rusts Austr. pl. 1, f. 3, 6, 10, pl. 3, f. 25; Grove, Brit. Rust Fungi f. 200, 201, 213, 214.

EXSICCATI: Barth. Fungi Columb. 2402, 2405, 2462, 2567, 2675, 3073, 3074, 3165, 3303, 3348, 3465, 3469, 3470, 3574, 3650, 3673, 3739, 3740, 3745, 3746, 3832, 3851, 3852, 4056, 4062, 4347, 4348, 4351, 4354, 4364, 4375, 4401, 4451, 4457, 4458, 4750, 4846, 4950, 4951, 5049, 5076, 5077; Barth. N. Am. Ured. 263, 268, 269, 270, 416, 417, 440, 526, 576, 628, 649, 666, 707, 870, 871, 904, 922, 932, 952, 1003, 1023, 1024, 1101, 1128, 1144, 1177, 1178, 1201, 1229, 1230, 1231, 1327, 1328, 1330, 1339, 1341, 1357, 1424, 1425, 1474, 1475, 1519, 1520, 1521, 1572, 1573, 1630, 1631, 1640, 1670, 1746, 1747, 1751, 1830, 1836, 1902, 1929, 1930, 2029, 2030, 2031, 2032, 2074, 2131, 2132, 2133, 2134, 2170, 2171; Brenckle, Fungi Dak. 58, 104, 109, 113, 154, 185, 185a, 339, 345; Clements, Crypt. Form. Colo. 137, 151, 312, 313, 316, 323, 592; Ellis, N. Am. Fungi 227, 1003a, 1005, 1423, 1471; Ellis & Ev. N. Am. Fungi 1842, 2213, 2214, 3347, 3348, 3480, 3575; Ellis & Ev. Fungi Columb. 61a, b, 193, 490, 1901, 1390, 1474, 1639, 1866, 1969, 2158; Garrett, Fungi Utah. 76, 126, 152, 156, 182, 218, 230; D. Griff. W. Am. Fungi 268, 268a, bis (in part), 276, 289, 289a, b, 292, 293, 318, 355, 355a, 366, 367; Kellerm. Ohio Fungi 61; Rab.-Wint. Fungi Eur. 3322b, 3420, 3421c; Rab.-Wint.-Paz. Fungi Eur. 3836; Rav., Fungi Car. 1: 94; Sydow, Ured. 899, 1079, 1343, 1380, 1708, 1709, 1766, 1767, 1905, 1935, 2305, 2315, 2434; Thümen, Myc. Univ. 1221; Vesterg. Micr. Rar. Sel. 1002.

89. *Dicaeoma Impatientis* (Schw.) Arth. Proc. Ind. Acad. Sci. 1903: 148. 1904.

Aecidium Impatientis Schw. Schr. Nat. Ges. Leipzig 1: 67. 1822.

Uredo Schweinitziana Spreng. Syst. Veg. 4^l: 571. 1827.

Caeoma (Aecidium) impatientatum Schw. Trans. Am. Phil. Soc. II. 4: 293. 1832.

Aecidium (Caeoma) impatientatum Schw. Trans. Am. Phil. Soc. II. 4: 309. 1832.

Puccinia Impatientis Arth. Bot. Gaz. 35: 19. 1903.

Puccinia Impatienti-Elymi Arth.; Kleb. Wirtsw. Rostp. 292. 1904.

Puccinia perminuta Arth. Bull. Torrey Club 34: 584. 1907.

Puccinia Elymi-Impatientis J. J. Davis, Trans. Wis. Acad. 19: 677. 1919.

O. Pycnia amphigenous, in small crowded groups, on discolored spots, honey-yellow becoming blackish, globose in vertical section, 50–80 μ in diameter; ostiolar filaments 30–55 μ long.

I. Aecia hypophyllous and caulicolous in circular or elliptic groups 5–10 mm. or more across, on larger, and more or less hypertrophied pale spots, cupulate, 0.3–0.4 mm. in diameter; peridium yellowish, the margin recurved and finely erose; peridial cells oblong or quadratish, 18–21 by 24–34 μ , the outer wall smooth, 5–9 μ thick, striate, the inner wall coarsely verrucose, thinner, 2–3 μ ; aeciospores angularly globoid or ellipsoid, 16–21 by 19–24 μ ; wall pale-yellow or colorless, thin, about 1.5 μ , moderately verrucose with occasional coarse, deciduous tubercles.

ON BALSAMINACEAE:

Impatiens biflora Walt. (*I. fulva* Nutt., *I. maculata* Muhl.), Arkansas, Indiana, Michigan, Nebraska, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Dakota, Vermont; Manitoba, Ontario, Quebec.

Impatiens pallida Nutt. (*I. aurea* S. Wats.), Connecticut, Delaware, District of Columbia, Indiana, Iowa, Kansas, Maryland, Michigan, Missouri, Nebraska, New York, Pennsylvania, South Dakota, Wisconsin, West Virginia; Ontario.

II. Uredinia chiefly epiphyllous, scattered, elliptic or oblong, small, 0.3–0.5 mm. long, yellowish-brown, rather tardily naked, ruptured epidermis evident; paraphyses rare, clavate or capitate, 9–13 by 16–35 μ , the wall colorless, thin, 1 μ , smooth; urediniospores globoid or ellipsoid, 13–19 by 16–24 μ ; wall moderately thin, 1–1.5 μ , pale-yellow, finely and closely echinulate, the pores 4–6, scattered, indistinct.

III. Telia hypophyllous, scattered, or crowded, oblong, 0.3–1 mm. long, grayish-black, long covered by the epidermis, surrounded by a thin layer of brownish hyphal stroma; teliospores clavate-oblong or cylindric, 10–18 by 26–45 μ , rounded or truncate above, usually narrowed below, slightly or not constricted at septum; wall thin, 1 μ or less, chestnut-brown, darker and slightly thickened above, 2–7 μ , smooth; pedicel very short, colored like the apex.

ON POACEAE:

Agrostis alba L., New York.

Agrostis hyemalis (Walt.) B.S.P., Delaware, Maine, New York.

Agrostis perennans (Walt.) Tuckerm. (*A. intermedia* Scribn., *A. Scribneriana* Nash), Delaware, District of Columbia, Indiana, Kentucky, Maine, Missouri, Ohio, Pennsylvania, Tennessee, West Virginia, Wisconsin; Nova Scotia.

Agrostis sp., North Carolina, Texas.

Cinna arundinacea L., Maryland, Missouri, New York, Wisconsin.

Cinna latifolia (Trev.) Griseb., Wisconsin.

Elymus canadensis L. (*E. robustus* Scribn. & Smith), Delaware, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, New York, North Dakota, Ohio, Oklahoma, Tennessee, West Virginia.

Elymus striatus Willd., Indiana, Nebraska, New York, Oklahoma, Wisconsin.

Elymus striatus arkansanus (Scribn. & Ball) Hitchc., Indiana.

Elymus virginicus L., Arkansas, Illinois, Indiana, Kansas, Missouri, Nebraska, New York, Oklahoma, Pennsylvania, Tennessee, Virginia, Wisconsin; Ontario, Quebec.

Hordeum jubatum L., Manitoba.

Hystrix Hystrix (L.) Millsp. (*H. patula* Moench, *Asprella Hystrix* Willd.), Indiana, Kentucky, Wisconsin.

TYPE LOCALITY: North Carolina, on *Impatiens maculata*.

DISTRIBUTION: Throughout the eastern United States and Canada from Nova Scotia, Ontario, and North Dakota southward to North Carolina and Texas.

EXSICCATI: Barth. Fungi Columb. 2666, 3256, 3357, 3557, 3558, 4060, 4150, 4757; Barth. N. Am. Ured. 347, 556, 642, 746, 852, 1159, 1254, 1656, 1852; Ellis, N. Am. Fungi 1001; Ellis & Ev. Fungi Columb. 196, 1964, 2071; D. Griff. W. Am. Fungi 299; Kellerm. Ohio Fungi 1; Rab.-Wint. Fungi Eur. 3318; Sydow, Ured. 1346, 2523, Thüm. Myc. Univ. 1121; Vesterg. Micr. Rar. Sel. 751.

90. *Dicaeoma glumarum* (Schmidt) Arthur & Fromme.

Uredo glumarum Schmidt, Nat. Landw. Schädl. Pilze. 1819; Fries, Om Brand och Rost 23. 1821.

Uredo glumarum Rab.; Desmaz. Pl. Crypt. France 1476. 1846; Ann. Sci. Nat. III. 8: 10. 1847.

Puccinia neglecta Westend. Bull. Soc. Bot. Belg. 2: 248. 1863.

Trichobasis glumarum Lév.; Cooke, Micr. Fungi 208. 1865.

Puccinia glumarum Erikss. & Henn. Zeits. Pflanzenkr. 4: 197. 1894.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly epiphyllous and on the sheaths and inflorescence, arranged in long lines, on golden-yellow streaks, sometimes narrow, but frequently forming broad stripes and sometimes affecting the entire leaf or other organ, narrowly oblong, small, up to 1 mm. long, but usually 0.5 mm. or less, orange-yellow, opening by a longitudinal slit, ruptured epidermis inconspicuous; paraphyses sometimes present, few, hyphoid, peripheral, incurved, 7–9 by 20–24 μ , the wall colorless, 1.5–3 μ thick on convex side, less than 1 μ thick on concave side, colorless, smooth; urediniospores ellipsoid or spheroid, somewhat angular, 16–26 by 19–30 μ , with pale-yellow contents; wall colorless, thin, about 1–2 μ , very finely and inconspicuously echinulate, the pores scattered, small, 10–15, usually very indistinct.

III. Telia hypophyllous and culmiculous, in long fine lines, similar to the uredinia in size, grayish-black, long covered by the epidermis, surrounded by stromal hyphae; teliospores oblong-clavate, 13–24 by 32–56 μ , truncate or rounded above, narrowed below, slightly constricted at septum, germinating at maturity; wall chestnut-brown above, paler below, thin, about 1 μ , slightly thickened at apex, 3–6 μ ; pedicel short, concolorous with spore-wall; mesospores sometimes present, 12–16 by 26–32 μ .

ON POACEAE:

Agropyron cristatum Beauv., Idaho.

Bromus carinatus Hookerianus (Thurb.) Shear, Washington.

Bromus marginatus Nees (*B. breviaristatus* Buckl.), Washington.

Bromus pacificus Shear, Washington.

Bromus sitchensis Bong., Washington.

Elymus canadensis L., Washington.

Elymus glaucus Buckl. (*E. americanus* Vasey & Scribn.), California, Oregon, Utah, Washington.

Hordeum depressum (Scribn. & Smith) Rydb., California.

Hordeum Gussoneanum Parl., Oregon.

Hordeum jubatum L., Colorado, Idaho, Montana, Utah, Washington, Wyoming; Alberta; Mexico (state).

Hordeum murinum L., California.

Hordeum nodosum L., Colorado.

Hordeum pusillum Nutt., Utah.

Hordeum vulgare L. (*H. sativum* Pers.), Oregon, Washington.

Secale cereale L., Idaho.

Sitanion Hystrix (Nutt.) J. G. Smith (*S. brevifolium* J. G. Smith, *S. elymoides* Raf., *S. longifolium* J. G. Smith), Colorado, Oregon.

Sitanion jubatum J. G. Smith, Oregon, Washington.

Triticum aestivum L. (*T. vulgare* Vill.), Arizona, Idaho, Montana, Oregon, Washington.

Triticum compactum Host, Oregon.

Triticum dicoccum Schrank, Oregon.

Triticum durum Desf., Idaho.

Triticum Spelta L., Idaho.

TYPE LOCALITY: Sweden, on *Triticum* sp.

DISTRIBUTION: Montana to Washington and southward to southern Mexico; also in Europe, northern Africa, and Japan.

ILLUSTRATIONS: Grove, British Rust Fungi 259; Erikss. & Henn. Getreider. *pl.* 5, *f.* 57-61, *pls.* 6-9; Beitr. Krypt. Schweiz 2²: *f.* 265; Zeits. Pflanzenkr. 8: 336; Krypt.-fl. Brand. Pilze 3: *f.* B188; Rostr. Plantep. Haandb. *f.* 92.

EXSICCATI: Barth. Fungi Columb. 3763, 4369, 4756; Barth. N. Am. Ured. 1063, 1755; Garrett, Fungi Utah. 138, 191, 192.

91. *Dicaeoma Hordei* (Fuckel) Arthur & Fromme.

Puccinia Hordei Fuckel, Jahrb. Ver. Nat. Nassau 15: 16. 1860.

O and I. Pycnia and aecia unknown.

II. Uredinia mostly epiphyllous, oblong, 0.2-0.5 mm. long, rather long covered by the epidermis, opening by a slit or pore, pulverulent, pale-yellow or cinnamon-brown, ruptured epidermis inconspicuous; urediniospores ellipsoid or obovoid, 18-24 by 22-28 μ ; wall pale-yellow or colorless, 1-1.5 μ thick, closely and rather finely echinulate, the pores 9-12, large, scattered.

III. Telia mostly hypophyllous, scattered or circinating about the uredinia, oval or linear, 0.2-1 mm. long, long covered by the epidermis, compact, chocolate-brown, surrounded by a thin, chocolate-brown stroma; teliospores angularly obovoid or clavate, 16-24 by 39-58 μ , obtuse or truncate above, narrowed below, slightly constricted at septum; wall chestnut-brown above, somewhat lighter below, 1.5-2.5 μ thick, thicker above, 3-7 μ , smooth; pedicel colorless, short; mesospores usually few, angularly obovoid, 16-23 by 32-40 μ .

The species differs from *Dicaeoma glumarum* (Schmidt) Arth. & Fromme in lacking the striped arrangement of the uredinia, in larger and more distinct pores in the urediniospores, and in thicker and darker-colored walls of the teliospores. It differs from *D. anomalum* (Rostr.) Arth. & Fromme in the larger number of pores in the urediniospores, and in the abundance of two-celled teliospores with few mesospores.

ON POACEAE:

Hordeum Gussoneanum Parl., California.

Hordeum montanense Scribn., Oregon.

Hordeum murinum L., California, Oregon.

Hordeum nodosum L., California, Oregon.

TYPE LOCALITY: Nassau, Germany, on *Hordeum murinum*.

DISTRIBUTION: Pacific coast of the United States from Oregon to southern California; also in Europe.

ILLUSTRATIONS: Krypt.-fl. Brand. Pilze 3: *f.* B179.

EXSICCATI: Barth. N. Am. Ured. 1740; Sydow, Ured. 1780.

92. *Dicaeoma anomalum* (Rostr.) Arthur & Fromme.

Puccinia straminis simplex Körn. Land. Forstw. Zeit. no. 50. 1865.

Puccinia Hordei Otth, Mitt. Nat. Ges. Bern 1870: 114. 1871. Not *P. Hordei* Fuckel, 1860.

Uromyces Hordei Nielsen, Ugeskr. Landm. 1: 567. 1875.

Puccinia anomala Rostr.; Thüm. Flora 61: 92. 1878.

Puccinia simplex Erikss. & Henn. Zeits. Pflanzenkr. 4: 260. 1894. Not *P. simplex* Peck, 1881.

Aecidium ornithogaleum Bubák, Ann. Myc. 3: 223. 1905.

O. Pycnia amphigenous, intermixed with the aecia or alone in rounded groups, occupying large areas, honey-yellow, becoming blackish, globoid, 100-150 μ in diameter; ostiolar filaments present.

I. Aecia scattered among the pycnia, cupulate, small, 0.2-0.3 mm. in diameter, opening by an apical pore; peridial cells irregularly oblong, the outer wall thick, 6-8 μ , transversely striate, the inner wall verrucose, thinner, 3-4 μ ; aeciospores ellipsoid, 18-30 μ in diameter, minutely and closely verrucose.

ON LILIACEAE:

Ornithogalum tenuifolium Guss. and *O. umbellatum* L., only in Europe.

II. Uredinia amphigenous, scattered, oblong or linear, 0.5-1 mm. long, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 16-24 by 22-29 μ ; wall yellowish, 1.5-2 μ thick, finely and loosely echinulate, the pores 8-10, scattered, rather indistinct.

III. Telia amphigenous, scattered, elliptic or oblong, 0.2-1 mm. long, dark blackish-gray, long covered by the epidermis, bordered by a thin layer of brownish stromal hyphae; teliospores angularly oblong or clavate, 18-25 by 39-58 μ , truncate, rounded or obtuse above, usually narrowed below, slightly constricted at septum; wall chestnut-brown, moderately thin,

about 1.5 μ , darker and thicker at apex, 3–6 μ , smooth; pedicel tinted, short; mesospores abundant, more numerous than the two-celled spores, 15–25 by 26–32 μ .

This species is not distinguishable morphologically from *Nigredo Hordei* (Tracy) Arth. with aecia on *Nothoscordium* (cf. Arthur, Mycologia 8 : 139. 1916), except in the production of two-celled teliospores. The two forms should be united eventually under one name.

ON POACEAE:

Hordeum vulgare L., California, Indiana, Iowa, Kentucky, Michigan, New York, Ohio, Oklahoma, Oregon, Tennessee, Wisconsin; Mexico (state); Ontario.

TYPE LOCALITY: Skärup, Denmark, on *Hordeum Zeocriton*.

DISTRIBUTION: New York to Iowa, and from Oregon to Utah southward through California to central Mexico; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2: f. 266; Grove, Brit. Rust Fungi f. 202; Zeits. Pflanzenkr. 8: 335, f. 4, 337, f. 5; Krypt.-fl. Brand. Pilze 3: f. B178; Rostr. Plantep. Haandb. f. 93.

93. *Dicaeoma subdigitatum* (Arth. & Holway) Arthur & Fromme.

Puccinia subdigitata Arth. & Holway; Arth. Am. Jour. Bot. 5: 468. 1918.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, elliptic, small, about 0.5 mm. long, early naked, yellowish, pulverulent, ruptured epidermis inconspicuous; paraphyses few, oblong or clavate, 10–15 by 26–35 μ , the wall pale cinnamon-brown, 1–2 μ thick; urediniospores globoid or broadly ellipsoid, 12–15 by 14–19 μ ; wall thin, 1 μ or less, pale-yellow or colorless, finely and closely echinulate, the pores obscure, probably scattered.

III. Telia chiefly hypophyllous, crowded but seldom confluent, elliptic or oblong, 0.5–1 mm. long, dark-gray, long covered by the epidermis, bordered by a thin layer of dark-brown stromal hyphae; teliospores oblong or clavate-oblong, 10–16 by 27–45 μ , truncate above, or with a few, 1–5, short digitate projections, usually somewhat narrowed below, slightly or not constricted at septum; wall dark chestnut-brown above, paler below, thin, about 1 μ , slightly thickened at apex, 3–7 μ including projections; pedicel very short, tinted.

ON POACEAE:

Brachypodium mexicanum (R. & S.) Link, Guatemala.

TYPE LOCALITY: San Rafael, Department of Guatemala, Guatemala, on *Brachypodium mexicanum*.

DISTRIBUTION: Known only from the type locality.

94. *Dicaeoma Arundinariae* (Schw.) Kuntze, Rev. Gen. 3³: 467. 1898.

Puccinia Arundinariae Schw. Schr. Nat. Ges. Leipzig 1: 72. 1822.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or in groups, circular or broadly elliptic, about 0.5 mm. in diameter, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 26–29 by 29–34 μ ; wall dark cinnamon-brown, 2–2.5 μ thick, moderately and strongly echinulate, the pores 4, occasionally 3, equatorial.

III. Telia hypophyllous, scattered, circular or broadly elliptic, about 1 mm. in diameter, chocolate-brown, early naked, prominently pulvinate and largely superficial, ruptured epidermis not apparent; teliospores oblong or cylindric, 18–24 by 47–77 μ , both ends somewhat tapering, slightly constricted at septum; wall light chestnut-brown, 2–2.5 μ thick, smooth, moderately thickened at apex, 4–7 μ ; pedicel colorless, long, once to twice length of spore.

ON POACEAE:

Arundinaria macrosperma Michx., Alabama, Oklahoma, South Carolina, Texas.

Arundinaria tecta (Walt.) Muhl., Alabama, Louisiana, Mississippi, South Carolina.

Arundinaria sp., North Carolina.

TYPE LOCALITY: Salem, North Carolina, on *Arundinaria* sp.

DISTRIBUTION: North and South Carolina to Oklahoma and Texas.

EXSICCATI: Barth. Fungi Columb. 2347, 4751; Barth. N. Am. Ured. 925, 1743.

95. *Dicaeoma melanocephalum* (Sydow) Arthur & Fromme.

Puccinia melanocephala Sydow, Ann. Myc. 5: 500. 1907.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, round, 0.3–1 mm. in diameter, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphyses peripheral, borne on

branched, septate, colorless, thin-walled hyphae, capitate, 16–19 by 32–48 μ , the wall light golden-brown, 2–3 μ thick, smooth, the stalk often very short; urediniospores ellipsoid, 23–26 by 23–37 μ ; wall cinnamon-brown, thick, 2.5–3 μ , rather sparsely and prominently echinulate, the pores 4 or 5, approximately equatorial.

III. Telia hypophyllous, scattered, round, 0.3–0.5 mm. in diameter, early naked, chestnut-brown, ruptured epidermis conspicuous; teliospores oblong, 19–22 by 35–45 μ , rounded above and below, constricted at septum; wall light chestnut-brown, or light-fuliginous, 1.5 μ thick, slightly thickened above, 3 μ , smooth; pedicel short, up to 26 μ , colorless.

ON POACEAE:

Phyllostachys aurea Riv., Florida.

Phyllostachys sp. not *aurea* or *bambusoides*, Florida.

TYPE LOCALITY: Wahjain, Khasi Hills, India, on *Arundinaria* sp.

DISTRIBUTION: In the Plant Introduction Garden at Brooksville, Florida; also in Asia.

96. *Dicaeoma ignavum* (Arth.) Arthur & Fromme.

Uredo ignava Arth. Bull. Torrey Club 46: 121. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, numerous, evenly scattered or loosely grouped, frequently in a linear series, on light-brown discolored areas, roundish or oblong, small, 0.2–0.6 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphyses encircling the sori, numerous, hyphoid, incurved, 10–13 by 29–45 μ , the wall pale cinnamon-brown or sometimes colorless, 1–1.5 μ thick, frequently thickened 3–5 μ on the convex side; urediniospores obovoid or ellipsoid, 14–19 by 23–27 μ ; wall colorless or pale cinnamon-brown, 1–2 μ thick, moderately echinulate, the pores obscure, probably 4, equatorial.

III. Telia unknown.

ON POACEAE:

Bambos vulgaris Schrad., Cuba; Jamaica; Porto Rico.

TYPE LOCALITY: Santiago de las Vegas, Cuba, on *Bambos vulgaris*.

DISTRIBUTION: West Indies.

97. *Dicaeoma obtectum* (Peck) Kuntze, Rev. Gen. 3³: 469. 1898.

Puccinia obtecta Peck, Bull. Buffalo Soc. Nat. Sci. 1: 66. 1873.

Aecidium compositarum Bidentis Burrill; De-Toni, in Sacc. Syll. Fung. 7: 799. 1888.

O. Pycnia amphigenous, gregarious, usually crowded in small groups about 0.5 mm. across, noticeable, projecting rather prominently above the surface of the leaf, honey-yellow becoming brownish, columnar or frustum-shaped, 80–100 μ broad by 110–130 μ high.

I. Aecia hypophyllous, gregarious, usually in annular groups 2–3 mm. across, cupulate, 0.2–0.3 mm. in diameter; peridium rather delicate, recurved and erose at margin; peridial cells rhomboidal, 23–27 μ long, somewhat overlapping, the outer wall rather thick, 5–7 μ , transversely striate, the inner wall thinner, 3–5 μ , verrucose; aeciospores globoid, 13–19 by 18–21 μ ; wall colorless, thin, 1 μ , very finely verrucose.

ON CARDUACEAE:

Bidens connata Muhl., Wisconsin.

Bidens frondosa L., Illinois, Nebraska, New Jersey, Wisconsin.

Bidens glaucescens Greene, Colorado, Kansas, Nebraska, New Mexico.

II. Uredinia amphigenous, in small groups 2–3 mm. across or often solitary, lenticular, 0.5–0.8 mm. or more long, sometimes confluent, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid, 13–20 by 25–35 μ ; wall light cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 2, equatorial.

III. Telia amphigenous, usually in compact compound groups 1–4 mm. across, surrounded by a brownish hyphal stroma, blackish-brown, long covered by the epidermis, usually noticeably raised above the leaf-surface; teliospores clavate or subcylindric, 16–23 by 58–64 μ , rounded, obtuse or narrowed above, usually narrowed below, slightly constricted at septum; wall chestnut-brown, 1–2 μ thick, much thicker above, 5–12 μ , smooth; pedicel tinted, concolorous, short, about one half length of spore or less.

ON CYPERACEAE:

Scirpus americanus Pers. (*S. pungens* Vahl), California, Colorado, Idaho, Illinois, Indiana, Massachusetts, Montana, Missouri, Nebraska, New Jersey, New Mexico, New York, Oklahoma, Oregon, South Dakota, Wyoming.

Scirpus californicus (C. Meyer) Britton, California, New Mexico.

Scirpus occidentalis (S. Wats.) Chase (*S. lacustris occidentalis* S. Wats.), California.

Scirpus Olneyi A. Gray, California; Aguascalientes, Mexico (state).

Scirpus validus Vahl (*S. lacustris* Bart. not L.), Colorado, Indiana, Iowa, Kansas, Michigan, Nebraska, New York, Virginia, Wisconsin; Ontario.

TYPE LOCALITY: New York, on *Scirpus validus*.

DISTRIBUTION: Massachusetts to Ontario and Oregon, and southward to southern Mexico.

EXSICCATI: Barth. Fungi Columb. 2363, 2364, 3561, 4365, 5068; Barth. N. Am. Ured. 158, 355, 854, 1261, 1662, 1663, 1859, 1999, 2051, 2258; Carleton, Ured. Am. 14; Ellis, N. Am. Fungi 1472; Ellis & Ev. North Am. Fungi 2235; Ellis & Ev. Fungi Columb. 192, 1650; D. Griff. W. Am. Fungi 250, 353; Sydow, Ured. 480, 1728, 2421; Zahlbr. Krypt. 2006.

98. *Dicaeoma Scirpi* (DC.) S. F. Gray, Nat. Arr. Brit. Pl. 1: 542.
1821.

Puccinia Scirpi DC. Fl. Fr. 2: 223. 1805.

Aecidium Nymphoidis DC. Fl. Fr. 2: 597. 1805.

Caeoma nymphoidatum Link, in Willd. Sp. Pl. 6²: 48. 1825.

Uredo Scirpi Schleich.; Secr. Mycogr. Suisse 3: 498. 1833.

Uredo Scirpi Westend. Bull. Acad. Brux. II. 11: 651. 1861.

Puccinia Typhae Kalchbr.; Rab. Fungi Eur. 695. 1864.

Aecidium Limnanthemii Thüm. Nuovo Giorn. Bot. Ital. 12: 196. 1880.

Dicaeoma Typhae Kuntze, Rev. Gen. 3²: 471. 1898.

O. Pycnia epiphyllous, in crowded, circular groups, about 0.5 mm. across, honey-yellow becoming brownish, flattened-globoid, 100–120 μ broad by 80–100 μ high; ostiolar filaments short, rarely protruding above the epidermis.

I. Aecia epiphyllous, in compact, circular groups, 5 mm. or more across, surrounding the pycnia, on yellowish spots, cupulate, small, 0.2–0.3 mm. in diameter; peridium fragile, evanescent; peridial cells rhomboidal, 16–26 by 27–34 μ , the outer wall thick, 7–9 μ , smooth, transversely striate, the inner wall thinner, 3–4 μ , strongly verrucose; aeciospores globoid, 16–23 μ ; wall thin, 1–1.5 μ , finely and closely verrucose, pale-yellow or colorless.

ON MENYANTHACEAE:

Nymphoides Grayanum (Griseb.) Arth. (*Limnanthemum Grayanum* Griseb.), Cuba.

II. Uredinia amphigenous, scattered or crowded, dark cinnamon-brown, elliptic or linear, 0.5–1 mm. long, tardily naked, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 16–21 by 24–32 μ ; wall golden- or cinnamon-brown, about 1.5 μ thick, moderately echinulate, the pores 2, equatorial.

III. Telia amphigenous, similar to the uredinia in shape and size but chocolate-brown in color; teliospores ellipsoid, clavate or oblong, 15–21 by 34–50 μ , rounded or obtuse above, usually narrowed below, slightly constricted at septum; mesospores rather abundant; wall moderately thin, about 1.5 μ , smooth, chestnut-brown, thicker above, 5–9 μ ; pedicel golden-brown, about two-thirds length of spore.

ON CYPERACEAE:

Scirpus americanus Pers. (*S. pungens* Vahl), Bermuda.

Scirpus validus Vahl (*S. lacustris* Bart, not L.), Porto Rico.

TYPE LOCALITY: France, on *Scirpus lacustris*.

DISTRIBUTION: West Indies; also in Europe.

ILLUSTRATIONS: Grove, Brit. Rust Fungi f. 185; Beitr. Krypt. Schweiz 2²: f. 218; Krypt.-fl. Brand. Pilze 3: f. B130.

99. *Dicaeoma McClatchieanum* (Dietel & Holway) Arthur.

Puccinia McClatchieana Dietel & Holway; Dietel, Erythea 2: 127. 1894.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, elliptic or oblong, 0.4–0.8 mm. long, rather tardily naked, finally somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or somewhat obovoid, 19–26 by 24–35 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 3 or 4, equatorial.

III. Telia chiefly hypophyllous, scattered or often in more or less evident series parallel with the veins, elliptic, oblong or linear, 0.5–1 mm. or more long, rather soon naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores clavate, 13–23 by 45–77 μ , rounded or obtuse above, slightly constricted at septum; wall light chestnut-brown, 1–1.5 μ thick, much thicker above, 7–13 μ , smooth; pedicel tinted, concolorous, short, about one half length of spore.

ON CYPERACEAE:

Scirpus microcarpus Presl (*S. rubrotinctus* Fernald, *S. sylvaticus digynus* Böck.), California, Colorado, Massachusetts, Montana, New York, North Dakota, Oregon, Washington, Wyoming; British Columbia, Nova Scotia.

TYPE LOCALITY: Pasadena, California, on "*Scirpus sylvaticus*."

DISTRIBUTION: Western Montana and British Columbia southward to southern California and in Nova Scotia, Massachusetts and the adjacent part of New York.

EXSICCATI: Barth. Fungi Columb. 3166, 4967, 5066; Barth. N. Am. Ured. 244, 816, 1026, 1131, 1132, 1353, 1855, 1953, Ellis, N. Am. Fungi 266; Ellis & Ev. Fungi Columb. 347; D. Griff. W. Am. Fungi 348; Sydow, Ured. 1810.

100. *Dicaeoma angustatum* (Peck) Kuntze, Rev. Gen. 3³: 467.
1898.

Puccinia angustata Peck, Bull. Buffalo Soc. Nat. Sci. 1: 67. 1873.

Aecidium Lycopi W. Gerard; Peck, Bull. Buffalo Soc. Nat. Sci. 1: 68. 1873.

O. Pycnia epiphyllous, few, gregarious, usually in small groups 1–2 mm. across, not conspicuous, honey-yellow becoming reddish-brown, somewhat flattened-globoid, 95–115 μ in diameter by 85–95 μ high; ostiolar filaments usually compact, 30–40 μ long.

I. Aecia hypophyllous, gregarious, in annular and more or less crowded groups 1–4 mm. across, cupulate, 0.2–0.3 mm. in diameter; peridium delicate, the margin slightly recurved, somewhat lacerate; peridial cells rhomboidal, 26–29 μ long, the outer wall rather thick, 7–9 μ , transversely striate, the inner wall thinner, about 3 μ , verrucose; aeciospores globoid, 16–18 by 19–21 μ ; wall colorless, 1–1.5 μ thick, finely verrucose.

ON LAMIACEAE:

Koellia virginiana (L.) MacM. (*Pycnanthemum lanceolatum* Pursh), Indiana.

Lycopus americanus Muhl. (*L. sinuatus* Ell.), Indiana, Kansas, Maine, Maryland, Nebraska, New Jersey, New York, North Dakota, Wisconsin; Ontario.

Lycopus rubellus Moench, Ontario.

Lycopus uniflorus Michx. (*L. communis* Bickn.), Indiana, Massachusetts, Michigan, New York, Wisconsin; New Brunswick.

Lycopus virginicus L., Alabama, Delaware, Maine, Missouri, New York, Pennsylvania; Ontario.

Mentha arvensis L., Nova Scotia.

Mentha canadensis L., California, Montana, South Dakota; Manitoba.

Monarda fistulosa L., Nebraska.

II. Uredinia chiefly hypophyllous, scattered, or often in more or less evident series parallel with the veins, oval or oblong, 0.5–0.8 mm. long, rather tardily naked, slightly pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or obovoid, 18–24 by 26–32 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 2, equatorial or superequatorial.

III. Telia chiefly hypophyllous, disposed like the uredinia, often confluent end to end, oval, oblong or linear, 0.5–1.5 mm. or more long, moderately early naked, without stroma, pulvinate, dark chocolate-brown, ruptured epidermis conspicuous; teliospores clavate or oblong-clavate, 14–23 by 42–67 μ , rounded or truncate above, usually narrowed below; wall golden-brown, 1.5–2 μ thick, much thicker at apex, 7–16 μ , smooth; pedicel concolorous, about length of spore.

ON CYPERACEAE:

Scirpus americanus Pers. (*S. pungens* Vahl), Nevada.

Scirpus atrocinctus Fernald, New York.

Scirpus atrovirens Muhl., Delaware, Illinois, Indiana, Iowa, Kansas, Maine, Michigan, Missouri, Nebraska, New York, North Dakota, Ohio, Pennsylvania, South Dakota, Virginia, West Virginia, Wisconsin; Ontario, Quebec.

Scirpus caespitosus L., New York.

Scirpus californicus (C. Meyer) Britton, California.

Scirpus cyperinus (L.) Kunth (*S. Eriophorum* Michx., *Eriophorum cyperinum* L.), Alabama, Delaware, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nebraska, New York, Ohio, Pennsylvania, West Virginia, Wisconsin, Virginia; Nova Scotia, Ontario, Quebec.

Scirpus fluviatilis (Torr.) A. Gray, Wisconsin.

Scirpus georgianus Harper, Delaware.

Scirpus microcarpus Presl (*S. rubrotinctus* Fernald), Manitoba.

Scirpus pallidus (Britton) Fernald, Arkansas, Nebraska.

Scirpus pedicellatus Fernald, New York.

Scirpus polyphyllus Vahl, Maryland.

Scirpus sp., Colorado, Louisiana.

TYPE LOCALITY: Watkins, New York, on *Scirpus Eriophorum*.

DISTRIBUTION: Nova Scotia to Manitoba and southward to Virginia, central Alabama and central Texas, and from western Nevada to southern California.

EXSICCATI: Barth. Fungi Columb. 2260, 2261, 3651, 4138; Barth. N. Am. Ured. 20, 326, 418, 528, 728, 815, 817, 1633, 1742, 2223; Brenckle, Fungi Dak. 105, 105a; Carleton, Ured. Am. 17; Ellis & Ev. Fungi Columb. 1077, 1640, 2141; Ellis & Ev. N. Am. Fungi 2996; D. Griff. W. Am. Fungi 277b; Kellerm. Ohio Fungi 26, 173; Rab.-Wint. Fungi Eur. 3223; Rab.-Wint.-Paz. Fungi Eur. 4115; Sydow, Ured. 2110, 2111, 2158, 2368; Thüm. Myc. Univ. 838.

101. *Dicaeoma Eriophori* (Thüm.) Kuntze, Rev. Gen. 3³: 468.
1898.

Puccinia Eriophori Thüm. Bull. Soc. Nat. Mosc. 55¹: 208. 1880.

Aecidium Ligulariae Thüm. Nuovo Giorn. Bot. Ital. 12: 196. 1880.

Puccinia Eriophori-alpini Allesch. Verz. Südbayern Beob. Basidiom. 22. 1884.

Aecidium Cinerariae Rostr. Overs. Danske Vid. Selsk. Forh. 1884: 17. 1884.

O. Pycnia epiphyllous, few, inconspicuous, becoming dark brown, globoid or flattened-globoid, 80–96 μ in diameter by 80–112 μ high; ostiolar filaments compact.

I. Aecia hypophyllous, gregarious, in irregular groups 1–10 mm. across, on larger discolored spots, cupulate, 0.3–0.5 mm. in diameter; peridium lacerate, recurved; peridial cells rhomboidal or oblong, 19–24 by 34–42 μ , the outer wall 10–13 μ thick, smooth, the inner wall 5–9 μ thick, colorless, verrucose; aeciospores globoid or broadly ellipsoid, 16–19 by 18–23 μ ; wall colorless, 1–2 μ thick, finely verrucose.

ON CARDUACEAE:

Senecio aureus L., Iowa, Michigan, New Hampshire, New York, Wisconsin.

Senecio ductoris Piper, Oregon.

Senecio Robbinsii Oakes, New Hampshire, Vermont.

Senecio sp., British Columbia.

II. Uredinia hypophyllous or amphigenous, often confluent in lines, 0.2–0.4 mm. wide by 0.3–1 mm. long, oblong, tardily naked, pulverulent, brownish, ruptured epidermis noticeable; urediniospores globoid, obovoid or ellipsoid, 19–26 by 23–29 μ ; wall golden-brown, 1.5–2 μ thick, moderately echinulate, the pores 2, superequatorial.

III. Telia hypophyllous, scattered or in rows parallel to the veins, 0.2–0.5 mm. wide by 0.2–2 mm. or more long, fairly early naked, pulvinate, blackish-brown, ruptured epidermis noticeable; teliospores ellipsoid or clavate, 16–23 by 35–60 μ , rounded or acute above, constricted at septum; wall cinnamon-brown, 1.5–3 μ thick, thicker above, 4–10 μ , smooth; pedicel length of spore or less, tinted.

ON CYPERACEAE:

Eriophorum angustifolium Roth (*E. polystachyon* L. in part), Vermont.

Eriophorum tenellum Nutt., Maine.

Eriophorum virginicum L., Connecticut, Indiana, Maine, Massachusetts, Wisconsin.

Eriophorum viridicarinatum (Engelm.) Fernald (*E. polystachyon latifolium* A. Gray), Indiana, Iowa, Nebraska, New York, Oregon, Vermont, Wisconsin.

Leucocoma alpina (L.) Rydb. (*Eriophorum alpinum* L.), New Hampshire, Vermont.

TYPE LOCALITY: Near Ssamodourowka, Siberia, on *Eriophorum latifolium*.

DISTRIBUTION: Connecticut to Nebraska and northward, and alpine summits in Oregon and British Columbia; also in northern Europe and Asia.

ILLUSTRATIONS: Rev. Myc. 6: pl. 49, f. 28–29; Krypt.-fl. Brand. Pilze 3: f. B129.

EXSICCATI: Barth. N. Am. Ured. 2245; Ellis, N. Am. Fungi 1425; Seym. & Earle, Econ. Fungi 54.

102. *Dicaeoma canaliculatum* (Schw.) Kuntze, Rev. Gen. 3³: 466.
1898.

Sphaeria canaliculata Schw. Trans. Am. Phil. Soc. II. 4: 209. 1832.

Dothidea canaliculata Berk. Grevillea 4: 103. 1876.

Phyllachora canaliculata Sacc. Syll. Fung. 2: 623. 1883.

Aecidium compositarum Xanthii Ellis, N. Am. Fungi 1018b. 1883.

Aecidium compositarum Ambrosiae Burrill; De-Toni, in Sacc. Syll. Fung. 7: 798. 1888.

Aecidium compositarum Xanthii Burrill; De-Toni, in Sacc. Syll. Fung. 7: 799. 1888.

Puccinia cellulosa Berk. & Curt.; Cooke, Grevillea 20: 108. 1892.

Puccinia canaliculata Lagerh. Tromsø Mus. Aarsh. 17: 51. 1894.

Puccinia nigrovelata Ellis & Tracy; Ellis & Ev. Bull. Torrey Club 22: 60. 1895.

Dicaeoma nigrovelata Kuntze, Rev. Gen. 3³: 469. 1898.

O. Pycnia amphigenous, gregarious, in small compact groups, honey-yellow becoming brownish, inconspicuous, globoid, 112–128 μ in diameter; ostiolar filaments up to 35 μ or more long.

I. Aecia chiefly hypophyllous, in orbicular or elongate groups 2–5 mm. or more across, on larger discolored spots or on swollen areas on the stems, cupulate, low, 0.2–0.3 mm. in diameter; peridium delicate, the margin finely eroded and slightly recurved; peridial cells rhomboidal, 23–29 μ long, slightly overlapping, the outer wall thick, 5–8 μ , striate, the inner wall thinner, 2–4 μ , verrucose; aeciospores globose, often angular, 13–16 by 15–19 μ ; wall thin, 1 μ or less, finely verrucose.

ON AMBROSIAEAE:

Ambrosia trifida L., Indiana, Missouri.

Xanthium sp., Arkansas, Delaware, Indiana, Iowa, New Mexico, Oklahoma, Pennsylvania.

II. Uredinia chiefly hypophyllous, scattered, oblong, 0.5–2 mm. long, tardily dehiscent by longitudinal slits, ruptured epidermis conspicuous, somewhat pulverulent, cinnamon-brown; urediniospores broadly ellipsoid or obovoid, 13–19 by 19–29 μ ; wall yellowish or cinnamon-brown, 1–2 μ thick, moderately and finely echinulate, the pores 2, equatorial.

III. Telia chiefly hypophyllous, scattered or more often confluent in groups 1–3 mm. or more long, individual sori linear, 0.1 mm. or less in width and surrounded by well developed brownish stroma, blackish or grayish-black, long covered by the epidermis, not or only slightly raised above the leaf surface; teliospores clavate-oblong, 15–21 by 39–64 μ , acuminate, obtuse or rounded above, narrowed below, slightly or not constricted at septum; wall dark cinnamon-brown, lighter toward base, about 1 μ thick, much thicker above, 3–10 μ ; pedicel short, tinted.

ON CYPERACEAE:

Cyperus cylindricus (Ell.) Britton (*C. Torreyi* Britton), Delaware.

Cyperus erythrorhizos Muhl., Missouri.

Cyperus esculentus L., California, Delaware, District of Columbia, Florida, Indiana, Kansas, Maryland, Michigan, Nebraska, New Jersey, New Mexico, Oklahoma, Texas; Mexico (state).

Cyperus Fendlerianus Böck., New Mexico.

Cyperus ferax L. C. Rich., Cuba; Porto Rico.

Cyperus giganteus Vahl, Porto Rico.

Cyperus Hallii Britton, Missouri.

Cyperus Houghtonii Torr., Nebraska, Wisconsin.

Cyperus Mutisii (H.B.K.) Griseb., Jamaica.

Cyperus reticulatus L., Porto Rico.

Cyperus rotundus L., Florida, Kansas.

Cyperus seslerioides H.B.K., Mexico (state).

Cyperus speciosus Vahl, Indiana, Kansas.

Cyperus strigosus L., Alabama, Arkansas, Delaware, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Mississippi, Nebraska, New York, Oklahoma, Pennsylvania, Virginia, West Virginia, Wisconsin; Ontario.

Cyperus surinamensis Rottb., Texas; Cuba.

Cyperus thyrsiflorus Jungh. (?), Mexico (state).

Cyperus sp., Colorado, North Carolina; Guatemala; Oaxaca.

TYPE LOCALITY: Bethlehem, Pennsylvania, on *Cyperus* sp.

DISTRIBUTION: New York to Michigan and Nebraska, and southward through Mexico, Central America, and the West Indies.

EXSICCATI: Barth. Fungi Columb. 2449, 2758, 4260; Barth. N. Am. Ured. 136, 137, 233, 337, 839, 1038, 1430, 1637; Carleton, Ured. Am. 10; Ellis, N. Am. Fungi 1018b; Ellis & Ev. Fungi Columb. 552, 983, 1760, 2144, 2146; Ellis & Ev. N. Am. Fungi 3143, 3352; Seym. & Earle, Econ. Fungi 393.

103. *Dicaeoma Cyperi* (Arth.) Kuntze, Rev. Gen. 3³: 466. 1898.

Puccinia Cyperi Arth. Bot. Gaz. 16: 226. 1891.

Uredo ustulata Berk. & Curt.; Cooke, Grevillea 20: 110, hyponym. 1892.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, often very numerous, oblong, 0.3–1.5 mm. long, tardily dehiscent by longitudinal slits, somewhat bullate; urediniospores ellipsoid or obovoid, 18–24 by 24–35 μ ; wall light cinnamon-brown, 1.5–2 μ thick, moderately and finely echinulate, the pores equatorial, usually 3, in occasional spores 2 or 4.

III. Telia chiefly hypophyllous, in groups 1–6 mm. long, or scattered, individual sori linear 0.1–0.2 mm. in width, with no or only slight development of stroma, somewhat tardily naked, dark chocolate-brown or blackish, pulvinate, ruptured epidermis conspicuous; teliospores broadly clavate-oblong, 18–26 by 35–61 μ , rounded or truncate above, narrowed below, slightly constricted at septum; wall chestnut-brown, paler below, about 1–1.5 μ thick, much thicker above, 7–12 μ , smooth; pedicel short, tinted.

ON CYPERACEAE:

Cyperus atropurpureus Liebm., Mexico (state).

Cyperus Buckleyi Britton, Michoacan.

- Cyperus Bushii* Britton, Kansas.
Cyperus cayennensis (Lam.) Britton, Cuba; Porto Rico.
Cyperus cylindricus (Ell.) Britton (*C. Torreyi* Britton), Alabama, Texas.
Cyperus dissitiflorus Nees, Panama.
Cyperus filiculmis Vahl, Connecticut, Delaware, Indiana, Kansas, Massachusetts, Nebraska, New York, Oklahoma, Texas, West Virginia, Wisconsin.
Cyperus flavicomus L., Mexico (state).
Cyperus globosus Aubl. (*C. echinatus* Wood), Alabama.
Cyperus Grayi Torr., New Jersey, New York.
Cyperus hermaphroditus (Jacq.) Standley, Guatemala.
Cyperus Houghtonii Torr., Wisconsin.
Cyperus lancastriensis Porter, Delaware.
Cyperus Mutisii (H.B.K.) Griseb., Jamaica.
Cyperus ovularis (Michx.) Torr., Alabama, Arkansas, Delaware, South Carolina.
Cyperus refractus Engelm., Delaware.
Cyperus retrofractus (L.) Torr., Alabama.
Cyperus Schweinitzii Torr., Illinois, Indiana, Iowa, Nebraska, Oklahoma, Wisconsin.
Cyperus spectabilis Schreb., Mexico (state), Morelos.
Cyperus strigosus L., Arkansas, Indiana, Missouri, New York.
Cyperus sp., North Carolina.
Kyllinga brevifolia Rottb., Porto Rico.
Kyllinga odorata Vahl, Guatemala.
Kyllinga pumila Michx., Grenada; Porto Rico; Martinique; Veracruz.
 TYPE LOCALITY: Decorah, Iowa, on *Cyperus Schweinitzii*.
 DISTRIBUTION: Massachusetts to Wisconsin and Nebraska, and southward through Mexico, Central America, and the West Indies.
 EXSICCATI: Barth. N. Am. Ured. 542, 837, 838, 1436, 1834, 2233; Ellis & Ev. Fungi Columb. 1850, 2145; Rav. Fungi Am. 278, 498; Sydow, Ured. 1016, 1017, 1177.

104. *Dicaeoma Cyperi-tagetiformis* (P. Henn.) Arthur.

Uredo Cyperi-tagetiformis P. Henn. Bot. Jahrb. 34: 598. 1905.
Puccinia Cyperi-tagetiformis Kern, Mycologia 11: 138. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous and culmicolous, scattered, oblong, 0.5–2 mm. long, tardily dehiscent by longitudinal slits, bullate, finally pulverulent, cinnamon-brown; urediniospores broadly ellipsoid or slightly obovoid, 15–21 by 19–26 μ ; wall dark cinnamon-brown or somewhat lighter, 1.5–2.5 μ thick, frequently thicker and lighter at apex, up to 3 μ , verrucose or verrucose-echinulate, the markings more pronounced above, the pores 2, equatorial.

III. Telia chiefly hypophyllous, most often confluent in groups 1–4 mm. or more long, individual sori linear, about 0.1 mm. in width, surrounded by well developed brownish stroma, blackish-brown, long covered by the epidermis, not much raised above the leaf-surface; teliospores clavate-oblong, 14–18 by 31–48 μ , acuminate, obtuse or rounded above, narrowed below, slightly constricted at septum; wall golden- or light cinnamon-brown, about 1 μ thick, much thicker above, 6–10 μ ; pedicel short, slightly tinted.

ON CYPERACEAE:

- Cyperus distans* L., Porto Rico.
Cyperus flavicomus L., Michx., Texas.
Cyperus laevigatus L., Porto Rico.
Cyperus odoratus L., Cuba; Porto Rico.
Cyperus polystachys Rottb., Porto Rico.
Cyperus radiatus Vahl, Porto Rico.
Cyperus sphacelatus Rottb., Porto Rico.
Cyperus surinamensis Rottb., Porto Rico.

TYPE LOCALITY: Kamodamura, Tosa, Japan, on *Cyperus tagetiformis*.

DISTRIBUTION: Southeastern Texas and the West Indies; also in India, Japan and the Philippine Islands.

EXSICCATI: Barth. N. Am. Ured. 1745.

105. *Dicaeoma abreptum* (Kern) Arthur.

Puccinia abrepta Kern, Mycologia 11: 140. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oval or oblong, 0.3–1 mm. long, somewhat bullate, rather tardily naked, ruptured epidermis conspicuous, cinnamon-brown; urediniospores ellipsoid or obovoid, 16–19 by 23–26 μ ; wall cinnamon-brown, 1–1.5 μ thick, moderately or sparsely echinulate, the pores 3, equatorial, covered with a swollen hyaline cuticle.

III. Telia not seen; teliospores narrowly ellipsoid or oblong, 13–16 by 27–45 μ , rounded above and slightly narrowed below, somewhat constricted at septum; wall light cinnamon-

brown, thin, $1\ \mu$ or less, thicker above, $3\text{--}5\ \mu$, smooth; pedicel about one half length of spore, tinted.

ON CYPERACEAE:

Cyperus ferax L. C. Rich., Costa Rica.

TYPE LOCALITY: San José, Costa Rica, on *Cyperus ferax*.

DISTRIBUTION: Known only from the type locality.

106. *Dicaeoma antioquiense* (Mayor) Arthur.

Puccinia antioquiensis Mayor, Mém. Soc. Neuch. Sci. Nat. 5: 473. 1913.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous and caulicolous, scattered, small, punctiform or somewhat oblong, long covered by the epidermis; urediniospores broadly ellipsoid or obovoid, $14\text{--}19$ by $18\text{--}26\ \mu$; wall nearly colorless or pale-yellow, thin, about $1\ \mu$, minutely and sparsely echinulate, the pores obscure, apparently 3, equatorial.

III. Telia caulicolous or hypophyllous, scattered, rounded or slightly elongate, long covered by the epidermis, finally dehiscent and somewhat pulverulent; teliospores clavate-oblong, $11\text{--}16$ by $35\text{--}50\ \mu$, rounded, truncate, or somewhat acuminate at apex, attenuate at base, slightly or not constricted at septum; wall golden- or light cinnamon-brown, paler below, very thin, about $1\ \mu$, thicker at apex, $1.5\text{--}3\ \mu$, smooth; pedicel about half length of spore, slightly tinted.

ON CYPERACEAE:

Cyperus diffusus Vahl, Panama.

TYPE LOCALITY: Antioquia, Colombia, on *Cyperus diffusus*.

DISTRIBUTION: Panama; also in South America.

107. *Dicaeoma Eleocharidis* (Arth.) Kuntze, Rev. Gen. 3³: 468. 1898.

Puccinia Eleocharidis Arth. Bull. Iowa Agr. Coll. Dep. Bot. 1884: 156. 1884.

Aecidium compositarum Eupatorii De-Toni, in Sacc. Syll. Fung. 7: 798. 1888.

O. Pycnia amphigenous, few in small orbicular groups, punctiform, honey-yellow becoming reddish-brown, rather inconspicuous, globoid, $100\text{--}170\ \mu$ in diameter; ostiolar filaments $35\text{--}60\ \mu$ long.

I. Aecia hypophyllous, in crowded groups about the pycnia on discolored spots that are usually conspicuous, cupulate, low, $0.2\text{--}0.3\ \text{mm.}$ in diameter; peridium delicate, the margin deeply lacerate and revolute; peridial cells rhomboidal, $24\text{--}34\ \mu$ long, the outer wall $4\text{--}6\ \mu$ thick, striate, the inner wall $2\text{--}3\ \mu$, verrucose; aeciospores globoid, $16\text{--}21$ by $18\text{--}24\ \mu$; wall colorless, about $1\ \mu$ thick, finely verrucose.

ON CARDUACEAE:

Eupatorium maculatum L., Colorado, Indiana, Iowa, Nebraska, New York.

Eupatorium perfoliatum L., Delaware, Illinois, Indiana, Iowa, Kansas, Maine, Michigan, Nebraska, New Jersey, New York, Pennsylvania, Wisconsin; Nova Scotia, Ontario.

Eupatorium purpureum L., Alabama, Delaware, Indiana, Iowa, Michigan, Nebraska, New Jersey, New York, Pennsylvania, Wisconsin; Manitoba, Quebec.

Eupatorium rotundifolium L., Delaware, Mississippi.

Eupatorium serotinum Michx., Louisiana, Oklahoma.

Eupatorium verbenaeifolium Michx., Alabama.

II. Uredinia chiefly culmicolous, scattered, oblong, $0.3\text{--}1\ \text{mm.}$ long, tardily dehiscent by longitudinal slits, somewhat bullate; urediniospores broadly ellipsoid or obovoid, $17\text{--}24$ by $26\text{--}40\ \mu$; wall yellowish or light cinnamon-brown, about $1.5\ \mu$ thick, rather sparsely and finely echinulate, the pores equatorial, usually 4, in occasional spores 3 or 5.

III. Telia chiefly culmicolous, scattered, oblong, $0.5\text{--}1.5\ \text{mm.}$ long, tardily dehiscent by longitudinal slits, somewhat bullate, blackish-brown; teliospores clavate-oblong, $13\text{--}19$ by $32\text{--}65\ \mu$, slightly or not constricted at septum, truncate, rounded, or obtuse above, somewhat narrowed at the base; wall light chestnut-brown, paler below, smooth, about $1\ \mu$ thick, much thicker at apex, $3\text{--}7\ \mu$; pedicel short, tinted.

ON CYPERACEAE:

Eleocharis capitata (L.) R. Br. (*Scirpus capitatus* L.), Cuba; Porto Rico.

Eleocharis intermedia (Muhl.) Schultes, Iowa, New York, Pennsylvania.

Eleocharis obtusa (Willd.) Schultes, Indiana, Oklahoma.

Eleocharis ovata (Roth) R. & S., New York, West Virginia.

Eleocharis palustris (L.) R. & S. (*E. glaucescens* Willd., *E. palustris glaucescens* A. Gray), Indiana, Iowa, Kansas, Michigan, Nebraska, New York, Pennsylvania, Wisconsin; Ontario, Quebec.

Eleocharis tenuis (Willd.) Schultes, Maine, Nebraska, New York, Oklahoma.

Eleocharis sp., Texas, Virginia; Manitoba.

TYPE LOCALITY: Spirit Lake, Iowa, on *Eleocharis intermedia*.

DISTRIBUTION: Maine and Quebec to Manitoba, southward east of the mountains to the Gulf of Mexico, and in Cuba and Porto Rico, the aecia being known only from the northern United States and adjacent parts of Canada.

EXSICCATI: Barth. Fungi Columb. 2355, 2759, 4144, 4662; Barth. N. Am. Ured. 338, 840, 938, 1043, 1238, 2241; Ellis, N. Am. Fungi 1419; Ellis & Ev. Fungi Columb. 1458, 1802, 2147, D. Griff. W. Am. Fungi 330; Shear, N. Y. Fungi 127; Sydow, Ured. 2023, 2414, 2516.

108. *Dicaeoma libertum* (Kern) Arthur.

Puccinia liberta Kern, Mycologia 11: 142. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly culmicolous, scattered, usually numerous, oval or oblong, 0.3–1.5 mm. long, sometimes longer by becoming confluent, tardily dehiscent by longitudinal slits, somewhat bullate, slightly pulverulent after dehiscence; urediniospores broadly ellipsoid or obovoid, sometimes more or less laterally compressed, 13–21 by 18–27 μ ; wall golden- or cinnamon-brown, 1.5–2 μ thick, moderately and finely echinulate, the pores 2, equatorial.

III. Telia rare, only few seen, resembling uredinia in shape and size, darker in color, tardily dehiscent by longitudinal slits, compact; teliospores clavate-oblong or fusiform, 14–18 by 40–50 μ , rounded or acuminate above, usually narrowed below; wall golden- or cinnamon-brown, often paler at apex, 1–1.5 μ thick, thicker above, 4–7 μ , smooth; pedicel short, tinted.

ON CYPERACEAE:

Eleocharis cellulosa Torr., Porto Rico.

Eleocharis flaccida (Reichenb.) Urban, Porto Rico.

Eleocharis geniculata (L.) R. Br., Guatemala; Cuba; Porto Rico.

Eleocharis montana (H.B.K.) R. & S., California.

Eleocharis mutata (L.) R. & S., Porto Rico.

Eleocharis palustris (L.) R. & S., California.

Eleocharis sp., Nicaragua.

TYPE LOCALITY: Granada, Nicaragua, on *Eleocharis* sp.

DISTRIBUTION: West Indies and Central America, and in southern California.

109. *Dicaeoma incompositum* (Kern) Arthur.

Uredo incomposita Kern, Mycologia 11: 143. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly culmicolous, scattered or sometimes in more or less evident groups, oval or oblong, 0.4–1.5 mm. or more long, tardily dehiscent by longitudinal slits, somewhat bullate; urediniospores broadly ellipsoid or obovoid, often somewhat angular, 18–26 by 27–37 μ ; wall golden- or cinnamon-brown, moderately echinulate, 1.5–2 μ thick, the pores 2, equatorial.

III. Telia not known.

ON CYPERACEAE:

Eleocharis geniculata (L.) R. Br., Porto Rico.

Eleocharis interstincta (Vahl) R. & S., Porto Rico.

Eleocharis sp., Guatemala.

TYPE LOCALITY: Mayagüez, Porto Rico, on *Eleocharis interstincta*.

DISTRIBUTION: Porto Rico and Guatemala.

110. *Dicaeoma Fuirenæ* (Cooke) Kuntze, Rev. Gen. 3³: 468. 1898.

Puccinia Fuirenæ Cooke, Grevillea 6: 137. 1878.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oval or somewhat lenticular, 0.3–1 mm. long, rather tardily naked, slightly pulverulent, dark chestnut-brown, ruptured epidermis noticeable; urediniospores ellipsoid or obovoid, 16–23 by 24–37 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately and finely echinulate, the pores 3–4, equatorial.

III. Telia hypophyllous, scattered, oval or oblong, 0.3–0.8 mm. long, rather soon naked, pulvinate, blackish-brown, ruptured epidermis noticeable; teliospores clavate, 15–18 by 55–

74 μ , rounded or obtuse above, very slightly constricted at septum; wall chestnut-brown, moderately thick, 2–2.5 μ , thicker above, 7–10 μ , smooth; pedicel slightly tinted, one half to once length of spore.

ON CYPERACEAE:

Fuirena breviseta Coville, Florida.

Fuirena hispida Ell., Alabama.

Fuirena simplex Vahl, Texas; Cuba.

Fuirena squarrosa Michx., South Carolina.

TYPE LOCALITY: Aiken, South Carolina, on *Fuirena squarrosa*.

DISTRIBUTION: From South Carolina along the Gulf of Mexico to Texas, and in Cuba.

EXSICCATI: Rav. Fungi Am. 54; Sydow, Ured. 1174.

111. *Dicaeoma fuirenicola* Arthur.

Uredo Fuirenae P. Henn. Hedwigia Beibl. 38: 70. 1899. Not *Dicaeoma Fuirenae* Kuntze, 1898.
Puccinia (?) *fuirenicola* Arth. Bull. Torrey Club 46: 109. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, elliptic or oblong, 0.5–1 mm. long, cinnamon-brown, tardily dehiscent by a longitudinal slit, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, globoid or obovoid, 18–23 by 23–27 μ ; wall moderately thick, 2–2.5 μ , golden- or cinnamon-brown, the pores 2, equatorial or approximately equatorial.

III. Telia unknown.

ON CYPERACEAE:

Fuirena umbellata Rottb., Cuba; Porto Rico.

TYPE LOCALITY: St. Catharine, Brazil, on *Fuirena umbellata*.

DISTRIBUTION: West Indies; also in South America and India.

112. *Dicaeoma Scleriae* (Paz.) Arthur.

Rostrupia Scleriae Paz. Hedwigia 31: 96. 1892.

Aecidium passifloricola P. Henn. Hedwigia 43: 168. 1904.

Puccinia Scleriae Arth. Mycologia 9: 75. 1917.

O. Pycnia hypophyllous, in groups 2–6 mm. in diameter, conspicuous, light-brown becoming chocolate-brown, globoid, 112–144 μ in diameter; ostiolar filaments 98–144 μ in length.

I. Aecia hypophyllous, crowded on yellowish-brown spots 0.5–2.5 cm. in diameter, cupulate, short, 0.1–0.3 mm. in diameter; peridium slightly yellowish, erose, fragile; peridial cells rhomboidal or oblong, 14–23 by 21–26 μ , abutted, the outer wall 3–4 μ thick, faintly striate, the inner wall 2–3 μ thick, closely and finely verrucose; aeciospores angularly globoid or oblong, 15–19 by 16–23 μ ; wall colorless, thin, 1 μ or less, closely and finely verrucose.

ON PASSIFLORACEAE:

Passiflora rubra L., Cuba; Jamaica; Porto Rico.

II. Uredinia culmicolous and amphigenous, scattered, oval or oblong, 0.1–0.5 mm. long, tardily naked, compact, cinnamon-brown, ruptured epidermis noticeable; urediniospores ellipsoid or obovoid, 13–19 by 19–27 μ ; wall pale cinnamon-brown or colorless, about 1 μ thick, moderately echinulate, the pores indistinct, probably 3 or 4, equatorial.

III. Telia culmicolous and hypophyllous, scattered, oval or oblong, 0.2–1 mm. long, long covered by the epidermis, blackish, surrounded by a strongly developed dark-brown stroma; teliospores cylindric or sometimes in 2-celled spores clavate, 1–4-celled, 12–16 μ wide, the 2-celled 32–61 μ long, the 3-celled 42–72 μ long, not or slightly constricted at septa, rounded or acute at apex, rarely somewhat narrowed below; wall golden- or cinnamon-brown, thin, 1 μ , 1–7 μ thick at apex; pedicel short, 3–16 μ long, chestnut-brown.

ON CYPERACEAE:

Scleria cubensis Böck., Porto Rico.

Scleria melaleuca Schlecht. & Cham., Panama.

Scleria pterota Presl, Cuba; Porto Rico.

Scleria setulosa-ciliata Böck., Panama.

TYPE LOCALITY: Itajahy, Brazil, on *Scleria* sp.

DISTRIBUTION: West Indies and Panama; also in South America.

113. *Dicaeoma scleriicola* Arthur.

Puccinia scleriicola Arth. Mycologia 7: 232. 1915.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, oval or oblong, small, 0.3–0.6 mm. long, punctiform, rather tardily naked, cinnamon-brown, somewhat pulverulent, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 15–22 by 19–26 μ ; wall pale-yellow, about 1.5 μ thick, finely and moderately echinulate, the pores indistinct, 4, or sometimes 3, equatorial.

III. Telia chiefly hypophyllous, scattered, oval or oblong, small, 0.3–0.4 mm. long, tardily naked, blackish-brown; teliospores oblong or clavate-oblong, 15–19 by 29–42 μ , slightly constricted at septum, truncate, oblique, or often rounded above, usually narrowed below; wall cinnamon-brown, 1.5–2 μ thick, usually thicker above, 3–6 μ , smooth; pedicel tinted, short.

ON CYPERACEAE:

Scleria Baldwinii Steud., Florida.

Scleria hirtella Sw., Florida; Porto Rico.

Scleria pauciflora Muhl., Georgia.

Scleria setacea Poir. (*S. Torreyana* Walp.), Florida.

Scleria verticillata Muhl., Florida; Cuba.

TYPE LOCALITY: Everglades, between Cutler and Longview Camp, Florida, on *Scleria verticillata*.

DISTRIBUTION: Southern Georgia southward into the West Indies.

114. *Dicaeoma Cladii* (Ellis & Tracy) Arth. Résult. Sci. Congr.

Bot. Vienne 344. 1906.

Puccinia Cladii Ellis & Tracy; Ellis & Ev. Bull. Torrey Club 22: 61. 1895.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered or often crowded on the peduncles so as to cover areas 2 cm. or more across, elliptic, small, 0.3–0.6 mm. long, rather tardily naked, somewhat pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 23–29 by 29–39 μ ; wall golden- or cinnamon-brown, 2–2.5 μ thick, moderately and very finely echinulate, the pores 4, sometimes 3, equatorial.

III. Telia comparatively few, resembling the uredinia in shape and size but blackish-brown in color; teliospores ellipsoid or clavate-oblong, 18–26 by 42–51 μ , moderately constricted at septum, rounded or obtuse at apex, usually narrowed below; wall dark chestnut-brown, somewhat paler below, thickened at apex, up to 9 μ ; pedicel golden-brown or nearly colorless, stout, one third length of spore or less.

ON CYPERACEAE:

Mariscus jamaicensis (Crantz) Britton (*Cladium effusum* Torr.), Mississippi, North Carolina; Bermuda; Porto Rico.

? *Rynchospora glomerata* (L.) Vahl, Virginia.

TYPE LOCALITY: Ocean Springs, Mississippi, on *Cladium effusum*.

DISTRIBUTION: Virginia to Mississippi and southward through the West Indies.

115. *Dicaeoma Fimbristylidis* Arthur.

Puccinia Fimbristylidis Arth. Bull. Torrey Club 33: 28. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous and caulicolous, oblong, 0.5–1 mm. long, rather tardily naked, dehiscent finally by longitudinal slits, brownish-yellow, pulverulent, ruptured epidermis noticeable; urediniospores broadly elliptic or globoid, 15–20 by 18–26 μ ; wall cinnamon- or golden-brown, moderately thick, 1.5 μ , moderately or sparsely and evenly echinulate, the pores 2, superequatorial.

III. Telia chiefly hypophyllous and caulicolous, scattered or confluent, oblong, up to 1.5 mm. long, compound, each component sorus round, surrounded by abundant, dark-brown, hyphal stroma, tardily naked, finally dehiscent by longitudinal slits, pulvinate, dark chestnut-brown, ruptured epidermis conspicuous; teliospores oblong, 16–19 by 34–55 μ , acute or obtuse above, somewhat narrowed at base, slightly constricted at septum; wall smooth, cinnamon-brown, moderately thick, 1.5–2.5 μ , thicker at apex, 4–9 μ ; pedicel tinted, usually as long as spore.

ON CYPERACEAE:

Fimbristylis diphylla (Retz.) Vahl, Martinique; Porto Rico.*Fimbristylis Holwayana* Fernald, Jalisco.*Fimbristylis polymorpha* Böck., Morelos.*Fimbristylis puberula* (Michx.) Vahl, Texas.TYPE LOCALITY: Cuernavaca, Mexico, on *Fimbristylis polymorpha*.

DISTRIBUTION: Texas, West Indies and southern Mexico.

EXSICCATI: Barth. N. Am. Ured. 1443.

116. *Dicaeoma superius* Arthur.*Uredo superior* Arth. Bull. Torrey Club 31: 5. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, elongate, tectate, spores escaping through slits in the epidermis; urediniospores globoid or ellipsoid, 18–29 by 30–36 μ ; wall variable in thickness, 2–3.5 μ , sometimes less, light chestnut-brown, moderately or thickly echinulate, the pores 2, super-equatorial.

III. Telia unknown.

ON CYPERACEAE:

Fimbristylis ferruginea (L.) Vahl, Cuba; Porto Rico.*Fimbristylis spadicea* Vahl, Haiti; Porto Rico.TYPE LOCALITY: Along the coast eight miles west of Ponce, Porto Rico, on *Fimbristylis spadicea*.

DISTRIBUTION: West Indies; also in South America.

117. *Dicaeoma* (?) *Dichromenae* Arthur.*Uredo Dichromenae* Arth. Bull. Torrey Club 33: 31. 1906.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oblong, 0.2–0.5 mm. long, covered by the over-arching epidermis; paraphyses none; urediniospores elliptic or broadly obovate, 18–23 by 22–35 μ ; wall light-yellow, moderately thick, 1.5–2 μ , sharply and sparsely echinulate, the pores obscure, probably 3 or 4, equatorial.

III. Telia unknown.

ON CYPERACEAE:

Dichromena ciliata Vahl, Porto Rico.*Dichromena radicans* Cham. & Schlecht., Costa Rica; Jamaica; Porto Rico.TYPE LOCALITY: Mayagüez, Porto Rico, on *Dichromena radicans*.

DISTRIBUTION: West Indies and Costa Rica; also in South America.

118. *Dicaeoma Rosenii* Arthur.*Puccinia Rosenii* Arth. Bull. Torrey Club 45: 144. 1918.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or often in more or less evident series parallel with the veins on indefinite, discolored spots, oval or linear, 0.5–2 mm. long, rather tardily naked, slightly pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores 30–35 μ long, when seen with pores in optical section oblong, 10–20 μ wide, when seen with pores central globoid or broadly ellipsoid, 28–35 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately or sparsely echinulate, the pores 2, superequatorial.

III. Telia hypophyllous, few, disposed like the uredinia, oblong or linear, tardily naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores clavate or cylindric, 16–23 by 43–67 μ , rounded or truncate above, usually narrowed below; wall chestnut-brown above, somewhat lighter below, 1–2 μ thick, much thicker at apex, 5–10 μ , smooth; pedicel colorless, thick-walled, somewhat shorter than spore, persistent.

ON CYPERACEAE:

Schoenus nigricans L., Florida.TYPE LOCALITY: Florida, on *Schoenus nigricans*.

DISTRIBUTION: Known only from the type locality.

119. *Dicaeoma angustatoides* (R. E. Stone) Arthur.*Puccinia angustatoides* R. E. Stone, Bull. Torrey Club 36: 549. 1909.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oblong or linear, 0.5–1 mm. long, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores obovoid or

ellipsoid, 16–23 by 23–32 μ ; wall light cinnamon-brown, about 1.5 μ thick, moderately and finely echinulate, the pores 2, superequatorial.

III. Telia hypophyllous, scattered, oval, oblong or linear, 0.3–1.5 mm. long, sometimes crowded and confluent end to end, rather early naked, without stroma, blackish, pulvinate, ruptured epidermis conspicuous; teliospores clavate or cylindric, 15–22 by 39–51 μ , slightly constricted at septum, rounded, obtuse or often acuminate at apex; wall chestnut-brown, 1.5–2 μ thick, much thicker above, 7–9 μ , smooth; mesospores rather common; pedicel tinted, concolorous, about as long as spore.

This species agrees closely with *Nigredo Rynchosporae* (Ellis) Arth., except in possessing two-celled teliospores, and in having urediniospores that are somewhat more variable in size and generally slightly larger and thicker-walled. The two forms should eventually be united under one name.

ON CYPERACEAE:

Rynchospora aurea Vahl, Porto Rico.

Rynchospora corniculata (Lam.) A. Gray (*R. macrostachya* Torr.), Alabama, Louisiana, Texas.

Rynchospora corymbosa (L.) Britton, Porto Rico.

Rynchospora cyperoides (Sw.) Mart., Bahamas; Porto Rico.

TYPE LOCALITY: Auburn, Alabama, on *Rynchospora corniculata*.

DISTRIBUTION: Locally from central Alabama to Texas and the West Indies.

120. *Dicaeoma consobrinum* (Arth. & Holway) Arthur.

Puccinia consobrina Arth. & Holway; Arth. Mycologia 10: 129. 1918.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oblong, 0.2–0.4 mm. long, soon naked, cinnamon-brown, ruptured epidermis noticeable; urediniospores globose or ellipsoid, 16–23 by 21–26 μ ; wall cinnamon-brown, 1.5–2.5 μ , moderately echinulate, the pores 2, equatorial.

III. Telia hypophyllous, scattered, ellipsoid, small, 0.1–0.2 mm. long, soon naked, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid or oblong, 19–23 by 32–39 μ , rounded at base and apex, somewhat constricted at septum; wall smooth, chestnut-brown, 2–3 μ thick, thicker at apex, about 7 μ , with lighter umbo; pedicel colorless, once to twice length of spore.

ON CYPERACEAE:

Rynchospora corymbosa (L.) Britton, Jamaica.

Rynchospora polyphylla Vahl, Costa Rica; Jamaica.

TYPE LOCALITY: San Ramón, Costa Rica, on *Rynchospora polyphylla*.

DISTRIBUTION: West Indies and Central America, a local species.

121. *Dicaeoma Caricis-polystachyae* (Dietel) Arthur & Kern.*

Puccinia Caricis-polystachyae Dietel, Ann. Myc. 4: 306. 1906.

Puccinia Kellermanii Kern, Mycologia 9: 210. 1917.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, oval or oblong, 0.4–0.7 mm. long, rather soon naked, pulverulent, pale cinnamon-brown, ruptured epidermis noticeable; urediniospores ellipsoid or obovoid, 18–26 by 25–32 μ ; wall light golden-brown, about 1.5 μ thick, moderately and distinctly echinulate, the pores 2, or sometimes 3 or 4, equatorial.

III. Telia chiefly hypophyllous, sometimes on the upper part of the culm or rachis, scattered, oval or oblong, 0.4–1 mm. long, early naked, chocolate-brown, ruptured epidermis noticeable; teliospores clavate-oblong, 16–21 by 30–45 μ , rounded or sometimes narrowed above, usually narrowed below, slightly constricted at septum; wall golden- or chestnut-brown, 1–1.5 μ thick, much thicker above, 5–10 μ ; pedicel tinted next to the spore, once to once and a half length of spore.

ON CYPERACEAE:

Carex madrensis L. H. Bailey, Morelos.

Carex polystachya Vahl. (*C. cladostachya* Vahl.), Guatemala; Oaxaca

TYPE LOCALITY: Oaxaca, Mexico, on *Carex polystachya*.

DISTRIBUTION: Southern Mexico and Guatemala.

* Species of *Dicaeoma* on *Carex* in collaboration with FRANK DUNN KERN.

122. *Dicaeoma atrofusum* (Dudley & Thompson) Arth. Résult.

Sci. Congr. Bot. Vienne 343. 1906.

Uromyces atrofusum Dudley & Thompson, Jour. Myc. 10: 55. 1904.*Puccinia atrofusca* Holway, Jour. Myc. 10: 228. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia of the usual sort amphigenous, scattered, oval or oblong, 0.2–0.5 mm. long, early naked, appanate, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid, 16–21 by 21–26 μ ; wall cinnamon-brown, 1.5–2 μ thick, rather closely echinulate, the pores 2, opposite.

Uredinia of the modified sort (amphisori) amphigenous, oval or oblong, 0.5–1 mm. long, early naked, pulvinate, slightly pulverulent, dark chocolate-brown, ruptured epidermis noticeable; urediniospores of the modified sort (amphisores) broadly ellipsoid or obovoid, 17–24 by 23–32 μ ; wall chestnut-brown, 2.5–3.5 μ thick, somewhat thicker above, 4–7 μ , rather sparsely but prominently verrucose-echinulate especially above, the pores 2, approximately equatorial.

III. Telia not seen; teliospores few in the uredinia, narrowly obovate-ellipsoid or clavate-oblong, 16–22 by 30–43 μ , rounded or obtuse at each end, slightly constricted at septum; wall chestnut-brown, 1.5–2 μ thick, much thicker above, 5–7 μ , smooth; pedicel slightly tinted, about length of spore.

ON CYPERACEAE:

Carex Douglasii Boott, California, Colorado, Montana, Nevada, New Mexico, Oregon, Washington, Wyoming; Alberta.

Carex nigricans C. Meyer, Utah.

Carex praegracilis W. Boott (*C. marcida* Boott, *C. usta* L. H. Bailey), California, Colorado.

TYPE LOCALITY: Palmers, Mariposa County, California, on *Carex Douglasii*.

DISTRIBUTION: Southern Alberta to Washington, and southward to New Mexico and southern California.

EXSICCATI: Barth. Fungi Columb. 2676, 3742; Barth. N. Am. Ured. 820, 1027, 1934, 1935; Clements, Crypt. Form. Colo. 547.

123. *Dicaeoma macrosporum* (Peck) Arthur & Kern.*Aecidium macrosporum* Peck, Ann. Rep. N. Y. State Mus. 23: 61. 1873.*Puccinia macrospora* Arth. Mycologia 1: 244. 1909.

O. Pycnia epiphyllous, gregarious, few, in groups on slightly discolored spots, not conspicuous, honey-yellow, flattened-globoid, 128–160 μ in diameter by 80–100 μ high; ostiolar filaments rather short.

I. Aecia hypophyllous, gregarious, chiefly in annular groups 1.5–5 mm. across, rather short, 0.1–0.2 mm. in diameter; peridium colorless, the margin erose; peridial cells linear-rhomboid, 32–42 μ long, rather thin, the outer wall smooth, the inner wall somewhat thicker, moderately verrucose; aeciospores globoid, very large, 32–42 by 37–51 μ ; wall colorless, moderately thick, 1.5–2.5 μ , thicker above, 5–10 μ , rather coarsely verrucose.

ON SMILACACEAE:

Smilax glauca Walt., New Jersey.

Smilax hispida Muhl., Kansas, New Jersey.

Smilax rotundifolia L., Delaware, New Jersey, New York.

II. Uredinia amphigenous, scattered or in longitudinal series, oblong, 0.5–1 mm. long, long covered by the epidermis; urediniospores obovate or narrowly ellipsoid, rather irregular, very large, 26–37 by 35–61 μ , often narrowed below to a thickened hilum; wall golden-yellow, evenly thick, 2.5–3.5 μ , echinulate with prominent points 3–4 μ apart, the pores obscure, 2, or sometimes 3, equatorial.

III. Telia chiefly hypophyllous, scattered or in longitudinal series, oblong or linear, 0.5–1.5 μ long, finally naked, pulvinate, chocolate-brown, ruptured epidermis noticeable; teliospores clavate, 16–23 by 61–67 μ , usually rounded or obtuse above, narrowed below, usually slightly constricted at septum; wall pale cinnamon-brown, paler below, 1.5–2.5 μ thick, much thicker at apex, 9–16 μ ; pedicel colorless, one half to once length of spore.

ON CYPERACEAE:

Carex comosa Boott, Delaware.

Carex vestita Willd., New Jersey.

Carex sp., New Jersey.

TYPE LOCALITY: Riverhead, New York, on *Smilax rotundifolia*.

DISTRIBUTION: Limited area near the coast from Long Island to Delaware, with a single collection of aecia from Kansas.

124. *Dicaeoma minutum* (Dietel) Arthur & Kern.

Puccinia minuta Dietel; Atk. Bull. Cornell Univ. 3: 19. 1897.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, roundish or oblong, 0.2–0.3 mm. long, rather tardily naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 19–26 by 29–39 μ ; wall cinnamon-brown, about 1.5–2.5 μ thick, evenly and rather sparsely echinulate, the pores 3, or sometimes 4, equatorial.

III. Telia hypophyllous, scattered, roundish or oblong, 0.2–0.3 mm. long, often appearing longer by becoming confluent end to end, rather tardily naked, blackish-brown, ruptured epidermis conspicuous; teliospores clavate-oblong or cuneate, small, 16–23 by 32–55 μ , not or only slightly constricted at septum, usually rounded above, wall light chestnut-brown, 1–1.5 μ thick, much thicker at apex, 5–9 μ , smooth; pedicel slightly tinted, about one half length of spore.

ON CYPERACEAE:

Carex verrucosa Muhl., Alabama, Florida.

TYPE LOCALITY: Auburn, Alabama, on *Carex verrucosa*.

DISTRIBUTION: Southeastern Alabama to northeastern Florida.

125. *Dicaeoma Lysimachiae* (Schw.) Kuntze, Rev. Gen. 3³: 467.
1898.

Aecidium Lysimachiae Schw. Schr. Nat. Ges. Leipzig 1: 67. 1822.

Caeoma Lysimachiae Schlecht. Fl. Berol. 2: 113. 1824.

Caeoma lysimachiatum Link, in Willd. Sp. Pl. 6²: 45. 1825.

Aecidium Lysimachiae Wallr. Fl. Crypt. Germ. 2: 252. 1833.

Puccinia Limosae Magn. Tagebl. Naturf. Vers. München 50: 199. 1877.

Puccinia lysimachiata Kern, Mycologia 9: 215. 1917. Not *P. Lysimachiae* P. Karst. 1879.

O. Pycnia amphigenous, gregarious in more or less open groups 0.5–1.5 mm. across, noticeable, honey-yellow becoming dark-brown, somewhat flattened-globose, 80–105 μ in diameter by 65–80 μ high; ostiolar filaments 40–60 μ long.

I. Aecia chiefly hypophyllous, gregarious, in large groups 3–12 mm. across, on larger discolored spots, more or less crowded, cupulate, 0.2–0.3 mm. in diameter; peridium colorless, the margin recurved, erose; peridial cells rhomboidal, 20–30 μ long, the outer wall 5–8 μ thick, striate, smooth, the inner wall 2–4 μ , finely verrucose; aeciospores globoid, 16–19 by 18–21 μ ; wall pale-yellow, thin, 1 μ , very finely verrucose.

ON PRIMULACEAE:

Lysimachia quadrifolia L., Connecticut, Massachusetts, New Jersey, New York, North Carolina.

Lysimachia terrestris (L.) B.S.P. (*L. stricta* Ait., *L. racemosa* Michx.), Connecticut, Delaware, New York, North Carolina, Pennsylvania.

Naumburgia thyrsoiflora (L.) Duby (*Lysimachia thyrsoiflora* L.), Illinois, Nebraska, New York, Wisconsin; Ontario.

II. Uredinia hypophyllous, scattered or in series parallel to the veins of the leaves, small, oblong or linear, soon naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 17–19 by 20–25 μ ; wall cinnamon-brown, 1.5–2 μ thick, evenly and rather sparsely echinulate, the pores 3 or 4, equatorial.

III. Telia hypophyllous, distributed like the uredinia, oblong or linear, 0.2–0.6 mm. long, soon naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores oblong or oblong-clavate, 15–19 by 32–45 μ , rounded or truncate above, usually narrowed below, slightly constricted at septum; wall dark chestnut-brown, somewhat paler below, 1–1.5 μ thick, much thicker above, 7–10 μ , smooth; pedicel light-yellow or nearly colorless, about three fourths length of spore.

ON CYPERACEAE:

Carex arcta Boott, Ontario.

Carex atratifomis Britton (*C. atrata ovata* Boott), Quebec.

Carex brunnescens (Pers.) Poir. (*C. canescens alpicola* Wahl.), Vermont.

Carex limosa L., Nebraska, Ohio; Ontario.

TYPE LOCALITY: North Carolina, on *Lysimachia quadrifolia*.

DISTRIBUTION: Nova Scotia to Delaware, and westward to Wisconsin and Nebraska; also in Europe.

ILLUSTRATIONS: Krypt.-fl. Brand. Pilze 3: f. B108.

EXSICCATI: Barth. Fungi Columb. 3848, 4152, 4153, 5064; Ellis, N. Am. Fungi 1424b; Ellis & Ev. N. Am. Fungi 2404.

126. *Dicaeoma Parnassiae* (Schlecht.) Arthur & Kern.*Caeoma Parnassiae* Schlecht. Fl. Berol. 2: 113. 1824.*Caeoma parnassiatum* Link, in Willd. Sp. Pl. 6²: 67. 1825.*Uredo Parnassiae* Spreng. Syst. Veg. 4: 571. 1827.*Aecidium Parnassiae* Graves; Duby, Bot. Gall. 904. 1830.*Puccinia uliginosa* Juel, Oefv. Sv. Vet.-Akad. Förh. 51: 409. 1894.*Dicaeoma uliginosa* Kuntze, Rev. Gen. 3³: 471. 1898.

O. Pycnia unknown.

I. Aecia hypophyllous or caulicolous, in small groups 3–4 mm. in diameter, cupulate, 0.2–0.3 mm. in diameter; peridium yellowish, the margin somewhat recurved, erose; peridial cells rhomboidal in side view, 16–26 by 20–30 μ , slightly overlapping, the outer wall 5–7 μ thick, striate, the inner wall 3–4 μ , closely verrucose; aeciospores irregularly globoid, 15–18 by 16–19 μ ; wall colorless, thin, 1–1.5 μ , finely and closely verrucose.

ON PARNASSIACEAE:

Parnassia palustris L., Alaska.

II. Uredinia amphigenous, scattered, oval or oblong, small, 0.1–0.3 mm. long, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis evident; urediniospores obovoid or ellipsoid, 16–21 by 21–28 μ ; wall dark cinnamon- or light chestnut-brown, 1.5 μ thick, moderately echinulate, the pores usually 3, sometimes 4, equatorial.

III. Telia mostly hypophyllous, scattered, oblong, 0.1–1 mm. long, early naked, compact, chestnut-brown, ruptured epidermis evident; teliospores ellipsoid or clavate, 15–21 by 32–45 μ , rounded above, narrowed below, somewhat constricted at septum; wall dark cinnamon- or chestnut-brown, thin, 1–2 μ , thickened at apex, 3–9 μ , smooth; pedicel light golden-brown, about half length of spore.

ON CYPERACEAE:

Carex spp., not yet found in America.TYPE LOCALITY: Berlin, Germany, on *Parnassia palustris*.

DISTRIBUTION: Kodiak island, Alaska; also in Europe.

127. *Dicaeoma eminens* (Kern) Arthur & Kern.*Puccinia eminens* Kern, Mycologia 9: 220. 1917.

O and I. Pycnia and aecia unknown.

II. Uredinia not seen; urediniospores broadly ellipsoid or obovoid, 15–21 by 23–32 μ ; wall cinnamon-brown, about 1.5 μ thick, evenly and rather sparsely echinulate, the pores 3, equatorial.

III. Telia hypophyllous, scattered, roundish or oval, 0.4–1 mm. long, early naked, pulverinate, chocolate-brown, ruptured epidermis noticeable; teliospores broadly clavate, 13–24 by 45–67 μ , slightly constricted at septum, rounded or more often narrowed above, narrowed below; wall chestnut-brown, 1.5–2 μ thick, very much thicker above, 7–16 μ , smooth; pedicel colorless, as long as spore or less.

ON CYPERACEAE:

Carex durifolia L. H. Bailey (*C. Backii* Boott), Manitoba.*Carex saximontana* Mackenzie (*C. durifolia subrostrata* Bates), Colorado, Nebraska.TYPE LOCALITY: Colorado, on *Carex saximontana*.

DISTRIBUTION: From Lake Winnipeg southward through western Nebraska to the foothills of Colorado.

128. *Dicaeoma Grossulariae* (Schum.) Kern, Trans. Am. Micr.

Soc. 32: 64. 1913.

Aecidium rubellum β *Grossulariae* Pers. in J. F. Gmel. Syst. Nat. 2²: 1473; hyponym. 1791.*Aecidium Rumicis* β *Grossulariae* Pers. Syn. Fung. 207. 1801.*Aecidium Grossulariae* Schum. Enum. Pl. Saell. 2: 223. 1803.*Caeoma grossulariatum* Link, in Willd. Sp. Pl. 6²: 59. 1825.*Puccinia Pringsheimiana* Kleb. Zeits. Pflanzenkr. 4: 194. 1894.*Puccinia Grossulariae* Lagerh. Tromsø Mus. Aarsh. 17: 60. 1895.*Puccinia Magnusii* Kleb. Zeits. Pflanzenkr. 5: 79. 1895.*Puccinia Ribis-nigri-acutae* Kleb. Zeits. Pflanzenkr. 6: 327. 1896.*Puccinia Ribesii-Pseudocyperi* Kleb. Jahrb. Wiss. Bot. 34: 391. 1899.*Puccinia Ribis-nigri-paniculatae* Kleb. Jahrb. Wiss. Bot. 34: 393. 1899.*Puccinia albiperidia* Arth. Jour. Myc. 8: 53. 1902.*Aecidium albiperidium* Arth. Jour. Myc. 8: 53. 1902.*Puccinia riparia* Holway, Jour. Myc. 10: 163. 1904.

- Dicaeoma albiperidium* Arth. Proc. Ind. Acad. Sci. 1903: 145. 1904.
Dicaeoma riparia Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.
Puccinia quadriporula Arth. Bull. Torrey Club 34: 586. 1907.
Puccinia Ribesii-Caricis Kleb. Zeits. Pflanzenkr. 17: 134. 1907.
Puccinia uniporula Orton, Mycologia 4: 201. 1912.

O. Pycnia chiefly epiphyllous, gregarious, on discolored spots, usually in groups 0.5–1.5 mm. across, honey-yellow becoming darker with age, flattened-globoid, 80–180 μ in diameter, 75–150 μ high; ostiolar filaments 65–100 μ long.

I. Aecia chiefly hypophyllous, but appearing also on the twigs, petioles and young fruits, gregarious, usually appearing on more or less orange-colored hypertrophied areas 2–8 mm. across, cupulate, 0.2–0.3 mm. in diameter; peridium short, spreading, the margin slightly recurved, irregularly dentate; peridial cells rhomboidal, 21–27 μ long, the outer wall 6–8 μ thick, striate, the inner wall 3–5 μ , verrucose; aeciospores globoid, 13–18 by 15–21 μ ; wall colorless, thin, about 1 μ , very finely verrucose.

ON GROSSULARIACEAE:

- Grossularia Cynosbati* (L.) Mill. (*Ribes gracile* Michx.), Indiana, Iowa, Michigan, New Hampshire, New York, Ohio, Vermont, Wisconsin; Ontario, Quebec.
Grossularia divaricata (Dougl.) Cov. & Britt. (*Ribes divaricatum* Dougl.), California, Oregon, Washington.
Grossularia hesperia (McClatchie) Cov. & Britt. (*Ribes hesperia* McClatchie), California.
Grossularia hirtella (Michx.) Spach (*Ribes saxosum* Hook.), Indiana, Maine, Massachusetts, Pennsylvania, Vermont; Nova Scotia.
Grossularia inermis (Rydb.) Cov. & Britt. (*Ribes inermis* Rydb., *R. vallicola* Greene), Colorado.
Grossularia leptantha (A. Gray) Cov. & Britt. (*Ribes leptanthum* A. Gray), Colorado, New Mexico.
Grossularia missouriensis (Nutt.) Cov. & Britt. (*Ribes gracile* Pursh), Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, Wisconsin.
Grossularia oxyacanthoides (L.) Mill., Alaska.
Grossularia reclinata (L.) Mill. (*Ribes Uva-crispa* L., *R. Grossularia* L.), Iowa, North Dakota, Wisconsin.
Grossularia setosa (Lindl.) Cov. & Britt., Montana, Wyoming.
Ribes acerifolium Howell (*R. Howellii* Greene), Washington.
Ribes alpinum L. (cult.), Alaska.
Ribes americanum Mill. (*R. floridum* L'Hér.), Connecticut, Illinois, Iowa, Michigan, Minnesota, Montana, Nebraska, New York, Ohio, South Dakota, Wisconsin; Ontario.
Ribes aureum Pursh (*Chrysobotrya aurea* Rydb.), Colorado, Montana.
Ribes bracteosum Dougl., Alaska; British Columbia.
Ribes glandulosum Weber (*R. prostratum* L'Hér.), Maine, New Hampshire, New York; British Columbia, Nova Scotia; Labrador.
Ribes Gordonianum Lem. (*R. odoratum* \times *sanguineum*), Alaska.
Ribes hudsonianum Richards., Alaska.
Ribes inebrians Lindl., Colorado, Montana.
Ribes lacustre (Pers.) Poir. (*Limnobotrya lacustris* Rydb., *L. echinata* Rydb.), Alaska, Idaho, New Hampshire, Oregon, Vermont; Alberta, Ontario.
Ribes laxiflorum Pursh, Alaska; British Columbia.
Ribes malvaceum Smith, California.
Ribes odoratum Wendl. (*R. longiflorum* Nutt., *Chrysobotrya odorata* Rydb.), Kansas, Oklahoma, Wisconsin.
Ribes petiolare Dougl., Idaho.
Ribes sanguineum Pursh, Alaska, Oregon.
Ribes triste Pall. (*R. rubrum* A. Gray not L.), Alaska.
Ribes vulgare Lam., Alaska, Indiana, Maryland.

II. Uredinia chiefly hypophyllous, scattered, oval or oblong, 0.1–0.5 mm. long, early naked or on some hosts rather tardily naked, somewhat pulverulent, ruptured epidermis usually not conspicuous; urediniospores globoid, broadly ellipsoid, or obovoid, 15–21 by 19–24 μ (rarely larger, up to 25–38 μ ; wall golden- or chestnut-brown, 1.5–2 μ thick, moderately, finely, and evenly echinulate, the pores 3 or sometimes 4, equatorial, not infrequently partly or wholly, 1 near the hilum, in a few cases 2 or 3 somewhat sub-equatorial.

III. Telia chiefly hypophyllous, scattered, roundish or oblong, 0.1–0.2 mm. broad by 0.1–0.5 mm. long, sometimes appearing larger when confluent end to end, early naked, or on some hosts rather tardily naked, ruptured epidermis not conspicuous, pulvinate, blackish-brown, or on some hosts long covered by the epidermis and grayish-black; teliospores broadly clavate, 12–24 by 26–58 μ , roundish, truncate, or rarely acuminate above, slightly or not constricted at septum; wall cinnamon- or light chestnut-brown, 1–1.5 μ thick, thicker at apex, 4–10 μ , smooth; pedicel one half length of spore or less, slightly tinted.

The species shows wide variation in the number and arrangement of the uredinial germ-pores and when more fully studied it may be found that these variations indicate more or less firmly estab-

lished races. The basal-pored form is morphologically identical with *Nigredo uniporula* (Kern) Arth., except in the septation of the teliospores, and this form should eventually be treated as a race of the augmented species.

ON CYPERACEAE:

- Carex aestivalis* M. A. Curtis, North Carolina.
Carex aquatilis Wahl. (*C. variabilis* L. H. Bailey), Colorado, Wyoming; British Columbia.
Carex arctata Boott, New Hampshire, New York, Wisconsin; Nova Scotia, Quebec.
Carex arctata × *flexilis* L. H. Bailey, Minnesota.
Carex Barbarae Dewey (*C. laciniata* Boott), California.
Carex Bigelovii Torr. (*C. concolor* R. Br., *C. rigida* Gooden.), Maine, New Hampshire, Vermont.
Carex blanda Dewey, Indiana, Iowa, Michigan, Minnesota, Nebraska, New York, North Dakota, Virginia, Wisconsin; Ontario.
Carex brunnescens (Pers.) Poir., Maine, Oklamoma, Wisconsin; Nova Scotia.
Carex canescens L., New York; Ontario.
Carex castanea Wahl. (*C. flexilis* Rudge), Wisconsin.
Carex cephalophora Muhl., Indiana.
Carex complanata Torr., New Jersey, Pennsylvania.
Carex conoidea Schkuhr, Indiana, New York.
Carex crinita Lam., Indiana, Maine, Maryland, Michigan, New York, Wisconsin; New Brunswick, Nova Scotia, Ontario, Quebec.
Carex disperma Dewey (*C. tenella* Schkuhr), Nova Scotia.
Carex eburnea Boott (*C. setifolia* Britton), Ontario, Quebec.
Carex exilis Dewey, New York.
Carex exsiccata L. H. Bailey, Oregon.
Carex fissuricola Mackenzie, California.
Carex flava L., New York; Ontario.
Carex flexuosa Muhl. (*C. tenuis* Rudge, *C. debilis* Rudgei L. H. Bailey), Maine, Michigan, New York, Pennsylvania, Vermont, West Virginia; Newfoundland, Nova Scotia, Quebec.
Carex Goodenowii J. Gay (*C. vulgaris* E. Fries), Maine.
Carex gracillima Schw., Maine, Michigan, New York, Pennsylvania, Vermont, Wisconsin, Ontario.
Carex granularis Muhl., Pennsylvania.
Carex gynandra Schw., New York, Pennsylvania, Vermont, Wisconsin.
Carex Haydeni Dewey, North Dakota.
Carex hirtifolia Mackenzie, New York, Wisconsin; Ontario.
Carex Hitchcockiana Dewey, Indiana.
Carex intumescens Rudge, Maine, Minnesota, New York, Wisconsin; Nova Scotia, Ontario.
Carex Kelloggii W. Boott, Oregon.
Carex lacustris Willd. (*C. riparia* Muhl. not Curt.), Iowa, Wisconsin.
Carex lanuginosa Michx., Colorado, Kansas, Wyoming.
Carex lupuliformis Sartwell, Indiana.
Carex Lyngbyei Hornem. (*C. cryptocarpa* C. Meyer), Washington.
Carex macrochaeta C. Meyer, Alaska; British Columbia.
Carex maritima O. F. Muell., Maine; Nova Scotia.
Carex Mertensii Prescott, Alaska, Oregon; British Columbia.
Carex nebraskensis Dewey (*C. Jamesii* Torr., not Schw.), Montana, Nebraska, New Mexico, Oregon.
Carex oblita Steud., New Jersey.
Carex obnupta L. H. Bailey (*C. magnifica* Dewey), Oregon, Washington.
Carex obtusata Lilj., Colorado.
Carex oligocarpa Schkuhr, Pennsylvania.
Carex pachystachya Cham., Oregon.
Carex pallescens L., Maine, New Hampshire, New Jersey, New York, Vermont; Nova Scotia.
Carex pedunculata Muhl., New York.
Carex plantaginea Lam., Nova Scotia.
Carex prasina Wahl., Pennsylvania, Wisconsin.
Carex pubescens Muhl., Indiana, Iowa, Ohio; Ontario.
Carex retrorsa Schw., Wisconsin.
Carex scabrata Schw., New York; Nova Scotia.
Carex sitchensis Prescott, Alaska.
Carex sparganioides Muhl., Indiana.
Carex spectabilis Dewey, Oregon; Alberta, British Columbia.
Carex squarrosa L., Illinois, Indiana, Michigan, Ohio.
Carex stipata Muhl., Iowa, New York.
Carex stricta Lam., Indiana, Massachusetts, New York, Pennsylvania.
Carex stygia Fries, Alaska.
Carex substricta (Kükenth.) Mackenzie, Iowa, Minnesota, Wisconsin.
Carex pachystachya Cham., Oregon.
Carex Swanii (Fernald) Mackenzie, New York.
Carex tetanica Schkuhr, Michigan.
Carex trichocarpa Muhl., New York.
Carex trisperma Dewey, New York, Wisconsin.
Carex typhina Michx., Illinois.
Carex virescens Muhl. (*C. costellata* Britton), New York, Ohio.
Carex sp., California, Missouri, Utah.

TYPE LOCALITY: Island of Zealand, Denmark, on *Ribes Grossularia*.

DISTRIBUTION: Nova Scotia to New Jersey, and westward to northern New Mexico, Oregon, and the southern coastal region of Alaska; also in Europe.

ILLUSTRATIONS: Krypt.-fl. Brand. Pilze 3: f. B107; Rostr. Plantep. Haandb. f. 90.

EXSICCATI: Barth. Fungi Columb. 2350, 2447, 2555, 2556, 3060, 3757, 3758, 3843, 3928, 3940, 4147, 4148, 4264, 4461, 4664, 4962; Barth, N. Am. Ured. 222, 447, 637, 638, 844, 845, 944, 945, 1025, 1047, 1048, 1049, 1079, 1152, 1244, 1245, 1345, 1346, 1446, 1547, 1652, 1846, 1941, 1942, 2039, 2040, 2147, 2148, 2149; Brenckle, Fungi Dak. 243, 301, 365; Clements, Crypt. Form. Colo. 596; Ellis, N. Am. Fungi 1006; Ellis & Ev. Fungi Columb. 357, 1904, 1968, 2101; Garrett, Fungi Utah. 214; D. Griff. W. Am. Fungi 360b; Kellerm. Ohio Fungi 81, 121, 149, 172; Kellerm. & Sw. Kansas Fungi 27; Seym. & Earle, Econ. Fungi 57, 207, 435.

129. *Dicaeoma Urticae* (Schum.) Kuntze, Rev. Gen. 3³: 467. 1898.

Aecidium Urticae Schum. Enum. Pl. Saell. 2: 222. 1803.

?*Uredo Caricis* Schum. Enum. Pl. Saell. 2: 231. 1803.

Caeoma Urticae Schlecht. Fl. Berol. 2: 112. 1824.

Caeoma urticatum Link, in Willd. Sp. Pl. 6²: 62. 1825.

Puccinia Caricis Schroet. Krypt. Fl. Schles. 3¹: 327. 1887. Not *P. Caricis* Rebent. 1804.

Puccinia Urticae Lagerh. Mitt. Bad. Bot. Ver. 2: 72. 1889. Not *P. Urticae* Barclay, 1888.

Dicaeoma Caricis Kuntze, Rev. Gen. 3³: 468. 1898.

Puccinia Garrettii Arth. Bull. Torrey Club 32: 41. 1905.

Uredo fatiscens Arth. Bull. Torrey Club 42: 593. 1915.

Puccinia urticata Kern, Mycologia 9: 214. 1917.

O. Pycnia chiefly epiphyllous, few, gregarious, in small groups, on discolored, somewhat hypertrophied areas, punctiform, noticeable, honey-yellow becoming brownish, globoid, large, 160–190 μ in diameter by 144–175 μ high; ostiolar filaments 50–90 μ long.

I. Aecia chiefly hypophyllous, in orbicular groups 1.5–4 mm. across, on hypertrophied spots, or in larger irregular groups on veins, petioles, and stems, crowded, rather short, 0.3–0.4 mm. in diameter, orange-yellow; peridium colorless, spreading and somewhat recurved, lacerate; peridial cells rectangular in longitudinal section, slightly longer than broad, 21–24 by 26–32 μ , slightly overlapping, the outer wall rather thick, 5–7 μ , smooth, the inner wall somewhat thinner, 3–5 μ , striate and moderately verrucose; aeciospores globoid, 15–19 by 18–23 μ ; wall pale yellow, thin, 1 μ , finely verrucose.

ON URTICACEAE:

Urtica cardiophylla Rydb., Montana.

Urtica gracilis Ait., Colorado, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Montana, Nebraska, New York, North Dakota, Ohio, Pennsylvania, South Dakota, Wisconsin, Wyoming; Ontario.

Urtica holosericea Nutt., Utah.

Urtica Lyallii S. Wats., Alaska, Oregon; British Columbia.

II. Uredinia chiefly hypophyllous, scattered, oblong, 0.3–0.8 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid, very rarely somewhat fusiform and even rostrate, rather large, 18–25 by 24–35 μ ; wall golden-brown, 1.5–2 μ thick, rarely considerably thicker, rather sparsely echinulate, the pores 3, rarely 4, equatorial.

III. Telia chiefly hypophyllous, scattered, oblong or linear-oblong, 0.2–0.3 mm. wide by 0.5–1 mm. long, soon naked, pulvinate, dark chocolate- or blackish-brown, ruptured epidermis conspicuous; teliospores mostly clavate, 15–23 by 39–71 μ , usually rounded above, the upper cell much broader and shorter than the lower cell, narrowed below into the pedicel; wall light chestnut-brown, paler below, about 1.5 μ thick, much thicker above, 7–12 μ , smooth; pedicel firm, tinted, usually darker than the lower portion of the spore, one half length of spore or less.

A more robust species than the preceding one, but similar to it in all its characters except in its aecial hosts.

ON CYPERACEAE:

Carex amplifolia Boott, Washington.

Carex aquatilis Wahl. (*C. variabilis* L. H. Bailey), Colorado, Idaho, Montana, Utah.

Carex atherodes Spreng. (*C. aristata* R. Br.), Colorado, Iowa, Montana, Nebraska, North Dakota, South Dakota.

Carex Baileyi Britton (*C. lurida gracilis* L. H. Bailey), Michigan, Pennsylvania.

Carex comosa Boott, Michigan.

Carex crinita Lam., Connecticut, New York.

Carex diandra Schrank (*C. teretiuscula* Gooden.), Nebraska.

Carex Emoryi Dewey, Indiana, Iowa, Kansas, Nebraska, North Dakota, Ohio.

Carex exilis Dewey, New York.

Carex exsiccata L. H. Bailey, Idaho.

Carex lacustris Willd. (*C. riparia* Muhl. not Curtis), Indiana, Iowa, Michigan, Nebraska, New York, Ohio, Wisconsin.

- Carex lanuginosa* Michx., Colorado, Montana, Wyoming.
Carex Lyngbyei Hornem. (*C. cryptocarpa* C. Meyer), Washington.
Carex nebraskensis Dewey (*C. Jamesii* Torr. not Schw.), Colorado, Montana, Nebraska, Oregon, Utah, Wyoming.
Carex nigricans C. Meyer, Wyoming; Alberta.
Carex nudata Boott, California.
Carex obnupta L. H. Bailey (*C. magnifica* Dewey), Oregon, Washington.
Carex Parryana Dewey, Wyoming.
Carex Pseudocyperus L., Michigan.
Carex retrorsa Schw., Wisconsin; British Columbia.
Carex rostrata Stokes (*C. urticulata* Boott), Colorado, Idaho, Montana, Oregon, Utah, Washington, Wisconsin.
Carex Sartwellii Dewey, Wisconsin.
Carex stipata Muhl., Indiana.
Carex stricta Lam., Connecticut, Delaware, Massachusetts, Michigan, New York, Pennsylvania,
Carex strictior Dewey, Michigan, New York, Wisconsin; Ontario.
Carex substricta (Kükenth.) Mackenzie, Montana, Wisconsin.
Carex trichocarpa Muhl., Indiana, Michigan, Wisconsin.
Carex triquetra Boott, California.
Carex viridula Michx., Oregon, Pennsylvania.
Carex sp., Illinois, Missouri, Virginia.

TYPE LOCALITY: Island of Zealand, Denmark, on *Urtica dioica*.

DISTRIBUTION: Across southern Canada and the northern United States from Massachusetts and Delaware to southeastern Alaska and central California; also in Europe, Siberia, and Japan.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 201; Krypt.-fl. Brand. 3: f. B105.

EXSICCATI: Barth. Fungi Columb. 2351, 2655, 3170, 3179, 3349, 3545, 3546, 3655, 3751, 3772, 3837, 3838, 3863, 3864, 3973, 4066, 4166, 4356, 4377, 4575, 4676, 4978, 4979, 5057, 5079; Barth. N. Am. Ured. 740, 770, 940, 972, 1081, 1082, 1242, 1673, 1878, 1975, 2076, 2077, 2174, 2175; Brenckle, Fungi Dak. 12, 118, 294; Clements, Crypt. Form. Colo. 550, 551, 601; Ellis, N. Am. Fungi 266, 726; Ellis & Ev. Fungi Columb. 1468, 1759; Garrett, Fungi Utah. 44, 45, 129, 130, 167, 172; D. Griff. W. Am. Fungi 339; Kellerm. Ohio Fungi 69, 70, 71, 192; Seym. & Earle, Econ. Fungi 388; Sydow, Ured. 464, 1065, 1575, 2115, 2513.

130. *Dicaeoma spatiosum* (Kern) Arthur & Kern.

Puccinia spatiosa Kern, Mycologia 9: 213. 1917.

O and I. Pycnia and aecia unknown.

II. Uredinia not seen; urediniospores intermixed with the teliospores, broadly ellipsoid, 26–29 by 30–39 μ ; wall light cinnamon-brown, 2–2.5 μ thick, sparsely and conspicuously echinulate, the pores 3, or sometimes 4, approximately equatorial.

III. Telia hypophyllous, scattered, or in more or less evident longitudinal series, oval, oblong or linear, 0.5–1 mm. long, sometimes confluent end to end, rather early naked, blackish, ruptured epidermis conspicuous; teliospores narrowly obovoid, 24–29 by 45–64 μ , considerably constricted at septum, rounded above, rounded or narrowed below; wall chestnut-brown, 1.5–2 μ thick, very much thicker above, 16–23 μ , smooth; pedicel nearly colorless, once to once and a half length of spore.

ON CYPERACEAE:

Carex sp., North Dakota, South Dakota.

TYPE LOCALITY: Brookings, South Dakota, on *Carex* sp.

DISTRIBUTION: Known only from the type locality and one station in North Dakota.

131. *Dicaeoma microsorum* (Körn.) Kuntze, Rev. Gen. 3³: 469. 1898.

Puccinia microsora Körn.; Fuckel, Fungi Rhen. 2637. 1874.

O and I. Pycnia and aecia unknown.

II. Uredinia of the typical sort amphigenous, scattered, oval or oblong, 0.5–1.5 mm. long, often large, bullate, long covered by the epidermis, surrounded by a rather thin, pale-brown stroma; urediniospores ellipsoid, 20–26 by 26–30 μ ; wall pale-yellow or nearly colorless, thin, about 1–1.5 μ , strongly and sharply echinulate, the pores obscure, apparently 4, equatorial.

Uredinia of the modified sort (amphisori) amphigenous, scattered, often arranged serially, roundish or elliptic, 0.3–0.6 mm. long, brownish, compact, long covered by the epidermis, surrounded by a moderately thick, light chestnut-brown stroma; urediniospores of the modified sort (amphisores) broadly spatulate or obovoid, 20–28 by 32–51 μ , rounded above, usually attenuate below; wall chestnut-brown, 2–3 μ thick, slightly thicker above, 3–5 μ , sparsely and inconspicuously verrucose, the pores 2, occasionally 3, equatorial; pedicel persistent, colorless, about length of spore.

III. Telia not seen; teliospores common in the uredinia (amphisorii), oblong or lanceolate, 13–19 by 35–64 μ , rounded or often narrowed both above and below, slightly or not constricted at septum, sometimes twice septate; wall pale-yellow or colorless, rather thin, 1–1.5 μ , thicker at apex, 2–4 μ , smooth; pedicel colorless, about one third length of spore or less.

ON CYPERACEAE:

Carex exsiccata L. H. Bailey, Oregon.
Carex Frankii Kunth, Virginia, West Virginia.
Carex lurida Wahl., Pennsylvania, Virginia.
Carex scabrata Schw., Pennsylvania, Wisconsin.
Carex Sprengelii Dewey (*C. longirostris* Torr.), Pennsylvania.
Carex Tuckermanni Dewey, Wisconsin.
Carex sp., Louisiana.

TYPE LOCALITY: Bonn, Germany, on *Carex vesicaria*.

DISTRIBUTION: Known from isolated localities in the mountains of Pennsylvania, West Virginia, and Virginia, the northern part of Wisconsin, and on the coast of Louisiana and Oregon; also in northern Europe.

EXSICCATI: Barth. N. Am. Ured. 2256.

132. *Dicaeoma minutissimum* (Arth.) H. S. Jackson, Proc. Ind.

Acad. Sci. 1915: 454. 1916.

Aecidium Nesaeae W. Gerard, Bull. Torrey Club 4: 47. 1873. Not *Dicaeoma Nesaeae* Kuntze, 1898.
Puccinia minutissima Arth. Bull. Torrey Club 34: 587. 1907.

O. Pycnia chiefly epiphyllous, gregarious on discolored spots, usually in small groups 0.5–2 mm. across, not very conspicuous, honey-yellow becoming dark reddish-brown, globose or flask-shaped, 95–115 μ in diameter by 125–150 μ high; ostiolar filaments 40–50 μ high.

I. Aecia chiefly hypophyllous or caulicolous, densely gregarious, on leaf-blades in roundish groups 2–5 mm. across, on stems or veins often causing hypertrophy and distortion of considerable extent, cupulate, 0.1–0.3 mm. in diameter; peridium delicate, the margin recurved and somewhat lacerate; peridial cells rhomboid, 29–45 μ long, the outer wall rather thick, 6–9 μ , transversely striate, the inner wall thinner, 3–7 μ , verrucose; aeciospores globose or broadly ellipsoid, 16–24 by 19–26 μ ; wall colorless, 1–2 μ thick, inconspicuously verrucose.

ON LYTHRACEAE:

Decodon verticillatus (L.) Ell. (*Nesaea verticillata* H.B.K.), Delaware, Indiana, Massachusetts, Michigan, New Jersey, New York, Ohio, Wisconsin; Ontario.

II. Uredinia hypophyllous, scattered, round or nearly so, 0.2–0.3 mm. across, early naked, chestnut-brown, pulverulent, ruptured epidermis conspicuous; urediniospores globose or broadly ellipsoid, small, 13–18 by 16–23 μ ; wall golden-brown, 1–1.5 μ thick, finely echinulate, the pores 2, slightly superequatorial.

III. Telia hypophyllous, numerous, scattered, roundish or oblong, 0.2–0.3 mm. wide, 0.2–7 mm. long, early naked, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores oblong-clavate, 15–22 by 39–64 μ , slightly constricted at septum, rounded or obtuse above, narrowed below; wall dark chestnut-brown, concolorous, smooth, 1–1.5 μ thick, much thickened above, 9–13 μ ; pedicel about one half length of spore, firm, slightly tinted or nearly colorless.

ON CYPERACEAE:

Carex lasiocarpa Ehrh. (*C. filiformis* Gooden. not L.), Indiana, Michigan, New York; Ontario.
Carex substricta (Kükenth.) Mackenzie, Ontario.

TYPE LOCALITY: Lansing, Michigan, on *Carex filiformis*.

DISTRIBUTION: Massachusetts to Ontario, and Wisconsin, and southward to Delaware and Indiana.

EXSICCATI: Barth. Fungi Columb. 4063, 4102; Barth. N. Am. Ured. 801, 951, 1001; Ellis & Ev. Fungi Columb. 258 in part, 1382; Ellis, N. Am. Fungi 1015; Kellerm. Ohio Fungi 91; Sydow, Ured. 2419, 2549; Thüm. Myc. Univ. 837.

133. *Dicaeoma Dracunculi* (Thüm.) Arthur & Kern.

Aecidium Dracunculi Thüm. Bull. Soc. Nat. Mosc. 58: 212. 1878. Not *Puccinia Dracunculi* Auersw.; Klotzsch. Herb. Viv. Myc. 1488. 1850.
Puccinia universalis Arth. Jour. Myc. 14: 21. 1908.

O. Pycnia chiefly epiphyllous, numerous, in orbicular groups, punctiform, honey-yellow, rather inconspicuous, slightly depressed-globose, 100–160 μ in diameter by 90–112 μ high; ostiolar filaments 40–80 μ long.

I. Aecia chiefly hypophyllous, in crowded sometimes orbicular groups 1–3 mm. across; peridium whitish, short-cylindric, usually about 0.5 mm. high, the margin usually erect, somewhat erose; peridial cells rhomboidal, 20–30 μ long, overlapping, the outer wall thick, 5–9 μ , transversely striate, smooth, the inner wall thinner, 3–4 μ , verrucose; aeciospores globoid, 12–18 by 15–21 μ ; wall nearly colorless, thin, about 1 μ , minutely verrucose.

ON CARDUACEAE:

- Artemisia argophylla* Rydb., Colorado.
Artemisia aromatica A. Nelson, Montana.
Artemisia biennis Willd., North Dakota.
Artemisia Brittonii Rydb., Colorado.
Artemisia camporum Rydb., Colorado, Iowa, Nebraska.
Artemisia cana Pursh, Montana.
Artemisia Carruthii Wood (*A. kansana* Britton), Nebraska, North Dakota, Texas.
Artemisia caudata Michx., Nebraska.
Artemisia dracunculoides Pursh, Colorado, Nebraska.
Artemisia filifolia Torr., Nebraska.
Artemisia Forwoodii S. Wats., Nebraska, North Dakota.
Artemisia franserioides Greene, Colorado, New Mexico.
Artemisia frigida Willd., Colorado, Montana, Nebraska, North Dakota, Wyoming.
Artemisia glauca Pall., Colorado.
Artemisia gnaphaloides Nutt., Colorado, Montana, Nebraska, New Mexico, North Dakota, South Dakota; Manitoba.
Artemisia heterophylla Nutt., California.
Artemisia longifolia Nutt., Montana, Nebraska, North Dakota.
Artemisia pacifica Nutt. (*A. Scouleriana* Rydb.), Colorado.
Artemisia silvicola Osterh., Colorado.
Artemisia tripartita Rydb. (*A. trifida* Nutt.), Montana.
Artemisia sp., Oregon.

II. Uredinia chiefly hypophyllous, scattered, oblong, 0.2–0.5 mm. long, rather early naked, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 15–20 by 20–26 μ ; wall cinnamon-brown, 1–1.5 μ thick, rather finely echinulate, the pores 2, slightly above the equator, or apparently equatorial.

III. Telia chiefly hypophyllous, scattered, roundish or oblong, 0.1–0.3 mm. wide by 0.2–1.2 mm. long, early naked, pulvinate, ruptured epidermis noticeable; teliospores clavate-oblong, 16–26 by 35–55 μ , slightly or not constricted at septum, rounded or obtuse above; wall dark chestnut-brown above, somewhat paler below, 1.5–2 μ thick, much thicker above, 7–12 μ , smooth; pedicel tinted, one half length of spore or more.

ON CYPERACEAE:

- Carex diandra* Schrank (*C. teretiusecula* Gooden.), Nebraska.
Carex Douglasii Boott, Colorado, Nebraska, New Mexico, North Dakota.
Carex filifolia Nutt., Montana, Nebraska, North Dakota, South Dakota, Wyoming.
Carex Geyeri Boott, Colorado.
Carex heliophila Mackenzie, Colorado, Minnesota, Montana, Nebraska, North Dakota.
Carex inops L. H. Bailey, Oregon.
Carex multicaulis L. H. Bailey, California, Oregon.
Carex obtusata Lilj., Colorado.
Carex oligocarpa Schkuhr, Wisconsin.
Carex petasata Dewey (*C. Liddonii* Boott), Colorado, Montana, Utah.
Carex praegracilis W. Boott (*C. marcida* Boott), Colorado, Nebraska, Nevada, North Dakota, Oregon, Wyoming; Manitoba.
Carex Rossii Boott, Colorado, Oregon; British Columbia.
Carex stenophylla Wahl., Colorado, Montana, Nebraska, North Dakota, Utah, Wyoming; Yukon.

TYPE LOCALITY: Near Minusinsk, southern Siberia, on *Artemisia Dracunculi*.

DISTRIBUTION: Mountains and adjacent plains from western Texas and northern California northward to Manitoba and central Yukon, 63° north latitude; also in Siberia and Japan.

EXSICCATI: Barth. Fungi Columb. 2446, 4165, 4275, 4376, 4469, 4675, 4765, 4980, 5078; Barth. N. Am. Ured. 273, 475, 668, 872, 1080, 1476, 1876, 1877, 1973, 1974, 2075, 2173, 2272; Brenckle, Fungi Dak. 106, 117, 131, 189, 346; Clements, Crypt. Form. Colo. 543, 593; Ellis & Ev. Fungi Columb. 1641, 1664; Ellis & Ev. N. Am. Fungi 2219b; D. Griff. W. Am. Fungi 277a 360, 360a; Sydow, Ured. 1712, 2435.

134. *Dicaeoma Phrymae* (Halsted) Arthur & Kern.

Aecidium Phrymae Halsted, Jour. Myc. 2: 52. 1886.
Puccinia Phrymae Arth. Jour. Myc. 14: 22. 1908.

O. Pycnia amphigenous, few, gregarious, in small crowded groups, inconspicuous, honey-yellow becoming blackish-brown, slightly flattened-globoid, 77–110 μ in diameter by 65–80 μ high; ostiolar filaments 40–50 μ long.

I. Aecia hypophyllous, gregarious, in large open groups on discolored areas 4–10 mm. across, very short, 0.2–0.3 mm. in diameter, pale-yellow; peridium colorless, the margin recurved, erose; peridial cells rhomboidal in longitudinal section, overlapping, the outer wall rather thick, 3–4 μ , striate, smooth, the inner wall thin, about 1 μ , finely verrucose; aeciospores 12–16 by 14–19 μ ; wall pale-yellow, thin, 1 μ or less, finely verrucose.

ON PHRYMACEAE:

Phryma Leptostachya L., Iowa, Minnesota, Nebraska, New York, South Dakota, Wisconsin.

II. Uredinia hypophyllous, scattered, roundish or oblong, 0.2–0.4 mm. long, early naked, ruptured epidermis noticeable; urediniospores obovoid or broadly ellipsoid, 13–18 by 18–23 μ ; wall light cinnamon-brown, 1–1.5 μ thick, finely and rather inconspicuously echinulate, the pores 2, in the upper part.

III. Telia hypophyllous, scattered, roundish or oblong, 0.2–0.4 mm. wide by 0.3–0.8 mm. long, early naked, dark chocolate-brown, pulvinate, ruptured epidermis noticeable; teliospores clavate-oblong, 12–18 by 29–45 μ , rounded or obtuse at apex, usually narrowed below, slightly constricted at septum; wall chestnut-brown, concolorous, 1–1.5 μ thick, much thicker above, 7–13 μ ; pedicel about length of spore or less, nearly colorless.

ON CYPERACEAE:

Carex Sprengelii Dewey (*C. longirostris* Torr.), Iowa, Nebraska, Wisconsin; Ontario.

TYPE LOCALITY: Spirit Lake, Iowa, on *Phryma Leptostachya*.

DISTRIBUTION: Locally from central Nebraska and South Dakota eastward to western New York.

EXSICCATI: Barth. Fungi Columb. 3958; Barth. N. Am. Ured. 253, 956, 1067.

135. *Dicaeoma Asterum* (Schw.) Arthur & Kern.

Aecidium Asterum Schw. Schr. Nat. Ges. Leipzig 1: 67. 1822.

Aecidium Solidaginis Schw. Schr. Nat. Ges. Leipzig 1: 68. 1822.

Caeoma asteratum Link, in Willd. Sp. Pl. 6²: 51. 1825.

Caeoma (Aecidium) erigeronatum Schw. Trans. Am. Phil. Soc. II. 4: 292. 1832.

Aecidium (Caeoma) asteratum Schw. Trans. Am. Phil. Soc. II. 4: 309. 1832.

Aecidium (Caeoma) erigeronatum Schw. Trans. Am. Phil. Soc. II. 4: 309. 1832.

Aecidium Bellidiastrum Unger, Exanth. Pfl. 109. 1833.

Aecidium Asteris Thüm. Myc. Univ. 935. 1878.

Aecidium Linosyridis Lagerh. Mitth. Bad. Bot. Ver. 46. 1888.

Puccinia extensicola Plowr. Brit. Ured. 181. 1889.

Puccinia firma Dietel, Hedwigia 31: 216. 1892.

Puccinia vulpinoidis Dietel & Holway; Dietel, Bot. Gaz. 19: 304. 1894.

Puccinia tecta Ellis & Barth. Erythea 4: 79. 1896.

Puccinia fusiformis Dietel, Hedwigia 36: 29. 1897.

Aecidium microsporum Dietel, Hedwigia 36: 34. 1897.

Dicaeoma extensicola Kuntze, Rev. Gen. 3³: 468. 1898.

Dicaeoma firmum Kuntze, Rev. Gen. 3³: 468. 1898.

Aecidium Grindeliae Sydow, Hedwigia Beibl. 40: 1. 1901.

Aecidium Boltoniae Arth. Bull. Torrey Club 28: 664. 1901.

Puccinia Caricis-Erigerontis Arth. Jour. Myc. 8: 53. 1902.

Puccinia Caricis-Asteris Arth. Jour. Myc. 8: 54. 1902.

Puccinia Caricis-Solidaginis Arth. Bot. Gaz. 35: 21. 1903.

Puccinia Dulichii Sydow, Monog. Ured. 1: 684. 1903.

Dicaeoma Caricis-Asteris Arth. Proc. Ind. Acad. Sci. 1903: 147. 1904.

Dicaeoma Caricis-Erigerontis Arth. Proc. Ind. Acad. Sci. 1903: 147. 1904.

Dicaeoma Caricis-Solidaginis Arth. Proc. Ind. Acad. Sci. 1903: 147. 1904.

Dicaeoma Dulichii Arth. Proc. Ind. Acad. Sci. 1903: 147. 1904.

Dicaeoma erigeronatum Arth. Résult. Sci. Congr. Bot. Vienne 344, 1906.

Puccinia asterum Kern, Mycologia 9: 224. 1917.

O. Pycnia amphigenous, chiefly epiphyllous, in orbicular groups 0.5–1.5 mm. across, crowded, punctiform, honey-yellow, rather inconspicuous, globoid, 80–150 μ in diameter; ostiolar filaments 45–65 μ long.

I. Aecia hypophyllous, in annular or crowded orbicular groups, 2–8 mm. or more across, on slightly hypertrophied and sometimes discolored spots; peridium whitish, cupulate, 0.1–0.3 mm. across, the margin much divided and recurved; peridial cells rhomboidal, 19–32 μ long, somewhat overlapping, the outer wall 5–9 μ thick, transversely striate, smooth, the inner wall thinner, 3–4 μ , verrucose; aeciospores globoid, 11–15 by 13–18 μ ; wall nearly colorless, thin, about 1 μ , minutely verrucose.

ON CARDUACEAE:

Aster acuminatus Michx., Nova Scotia.

Aster adscendens Lindl., Colorado, Montana, Utah.

- Aster Andersonii* A. Gray, California.
Aster apricus (A. Gray) Rydb., Montana.
Aster Canbyi Vasey (*A. spathulatus* Lindl.), Wyoming.
Aster chilensis Nees, California.
Aster ciliomarginatus Rydb., Utah.
Aster conspicuus Lindl., Montana.
Aster cordifolius L., Connecticut, Indiana, Iowa, Michigan, Missouri, New Hampshire, New York, Vermont; Nova Scotia, Ontario.
Aster Drummondii Lindl., Indiana, Iowa, Kansas, Texas.
Aster exiguus (Fernald) Rydb., Nebraska, South Dakota.
Aster foliaceus Lindl., Alaska.
Aster Fremontii (T. & G.) A. Gray, Utah, Wyoming.
Aster frondeus (A. Gray) Greene, Montana.
Aster laetivirens Greene, Idaho.
Aster laevis L., Colorado, Nebraska, New Mexico.
Aster longifolius Lam., New York, North Dakota.
Aster macrophyllus L., New York; Ontario.
Aster multiflorus Ait., Nebraska, North Dakota.
Aster nebraskensis Britton, Nebraska.
Aster paniculatus Lam. (*A. bellidiflorus* Willd.), Indiana, Iowa, Nebraska, Ohio.
Aster prenanthoides Muhl., Wisconsin.
Aster puniceus L., Indiana, New Hampshire, New York.
Aster sagittifolius Willd., Iowa, Kansas, Missouri, Virginia, Wisconsin.
Aster salicifolius Lam., Indiana.
Aster Tradescanti L., Ohio.
Aster Tweedyi Rydb., Colorado.
Aster yosemitana Greene, California.
Aster sp., Alabama, District of Columbia, Florida, Louisiana, Nevada, Oregon, Washington, West Virginia; Alberta; Newfoundland.
Boltonia asteroides (L.) L'Hér., Iowa, Nebraska, North Dakota, South Dakota.
Brachychaeta sphacelata (Raf.) Britton, Indiana.
Chrysogonum virginianum L., Maryland.
Chrysothamnus Parryi (A. Gray) Greene, New Mexico.
Doellingeria umbellata (Mill.) Nees (*Aster umbellatus* Mill.), Indiana, Maine, Michigan, New York; Nova Scotia.
Erigeron annuus (L.) Pers. (*E. heterophyllus* Muhl.), Arkansas, Connecticut, Delaware, Illinois, Indiana, Iowa, Maryland, Massachusetts, Missouri, New Jersey, New York, Pennsylvania, Virginia, Wisconsin.
Erigeron macranthus Nutt., Montana.
Erigeron philadelphicus L., Iowa, Missouri, Nebraska.
Erigeron pulchellus Michx. (*E. bellidifolius* Muhl.), Connecticut, Illinois, Indiana, Massachusetts, Missouri, New York, Pennsylvania.
Erigeron ramosus (Walt.) B.S.P. (*E. strigosus* Muhl.), Illinois, Indiana, Iowa, Kansas, Massachusetts, Missouri, Nebraska, New Jersey, New York, Oklahoma, South Dakota, Virginia, Wisconsin.
Erigeron salsuginosus (Richards.) A. Gray, California; British Columbia.
Erigeron speciosus DC., Oregon.
Erigeron sp., Texas.
Eucephalus ledophyllus (A. Gray) Greene (*Aster Engelmanni ledophyllus* A. Gray), Washington.
Euthamia caroliniana (L.) Greene (*Solidago tenuifolia* Pursh), Massachusetts.
Euthamia graminifolia (L.) Nutt. (*Solidago lanceolata* L.), Delaware, Maine, New York, Ohio, Pennsylvania, Vermont, Virginia, West Virginia, Wisconsin; Ontario.
Euthamia occidentalis Nutt., Oregon.
Grindelia squarrosa (Pursh) Dunal, Kansas, Nebraska.
Helenium autumnale L., Nebraska.
Helenium macranthum Rydb. (*H. autumnale grandiflorum* A. Gray), Colorado.
Heterotheca subaxillaris (Lam.) Britt. & Rusby, Texas.
Leptilon canadense (L.) Britton (*Erigeron canadensis* L.), Connecticut, Indiana, Iowa, Kansas, Maryland, Missouri, Nebraska, New York, South Dakota, Texas, Wisconsin.
Oreochrysum Parryi (A. Gray) Rydb. (*Solidago Parryi* Greene), Colorado.
Polymnia canadensis L., Iowa, Wisconsin.
Solidago altissima L., Delaware, Indiana, Iowa, Maryland, Michigan, Nebraska, New York, North Dakota, Pennsylvania, Virginia; Ontario.
Solidago caesia L., Louisiana, New York, Vermont.
Solidago canadensis L., Indiana, Michigan, Nebraska.
Solidago elongata Nutt., California, Montana.
Solidago erecta Pursh, Virginia.
Solidago flexicaulis L. (*S. latifolia* L.), Indiana, Iowa, Missouri, New York, Wisconsin; Ontario.
Solidago gilvocanescens (Rydb.) Smyth, Nebraska.
Solidago glaberrima Martens (*S. missouriensis* A. Gray not Nutt.), Colorado, Iowa, Minnesota, Montana, Nebraska.
Solidago juncea Ait., New York.
Solidago macrophylla Pursh (*S. thrysoidea* E. Meyer), New Hampshire, New York.
Solidago mollis Bartl., Nebraska.
Solidago neglecta T. & G., Maryland, Massachusetts.
Solidago nemoralis Ait., Alabama, Connecticut, Missouri, New York.
Solidago polyphylla Rydb., Maryland.

Solidago rigida L., Iowa, Kansas, Montana, Nebraska, Wyoming.
Solidago rugosa Mill., Delaware, Maine, New Jersey, New York; Quebec.
Solidago sempervirens L., Delaware.
Solidago serotina Ait. (*S. Pitcheri* Nutt.), Colorado, Idaho, Indiana, Iowa, Kansas, Nebraska, New Mexico, New York, Pennsylvania; Ontario.
Solidago speciosa Nutt., Missouri.
Solidago uliginosa Nutt., New York.
Solidago ulmifolia Muhl., Indiana, Iowa, New York, Wisconsin.

II. Uredinia hypophyllous, scattered, round or oblong, small, 0.1–0.2 mm. long, soon naked, or on some hosts rather tardily naked, light cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or broadly ellipsoid, small, 12–19 by 16–23 μ ; wall light cinnamon-brown, 1–1.5 μ thick, finely echinulate, the pores 2, in the upper part.

III. Telia hypophyllous, scattered, round or oblong, 0.1–0.3 mm. wide by 0.2–0.8 mm. long, soon naked, or on some hosts rather tardily naked, blackish-brown, ruptured epidermis conspicuous; teliospores clavate or oblong-clavate, 12–20 by 35–50 μ , slightly or not constricted at septum; wall chestnut-brown, 1–1.5 μ thick, thicker above, 5–10 μ , smooth; pedicel tinted next to the spore, about one half length of spore.

This species is morphologically the same as *Nigredo perigynia* (Halsted) Arth., except in the septation of the teliospores, and the two forms should eventually be united under one name.

The species is similar to the two following species, *D. Peckii* and *D. hieraciatum*, but in general may be separated from both of them by the aecial hosts, from *D. Peckii* by the smaller urediniospores, and from *D. hieraciatum* by the narrower teliospores. Numerous cultures combined with field observations have shown the existence of well fixed races, especially the three called *Puccinia Caricis-Asteris* Arth., *P. Caricis-Erigerontis* Arth., and *P. Caricis-Solidaginis* Arth., associated with the aecial host-genera *Aster*, *Erigeron*, and *Solidago* and their close allies respectively, and to a much less degree associated with certain species of the telial hosts.

ON CYPERACEAE:

Carex abdita Bickn., Indiana.
Carex aenea Fernald, Minnesota, Wisconsin.
Carex alata Torr., Louisiana, Virginia.
Carex albolutescens Schw., Delaware, Florida.
Carex alma L. H. Bailey, California.
Carex angustior Mackenzie, Maine, New York.
Carex arcta Boott, Oregon.
Carex athrostachya Olney, Oregon.
Carex Bebbii Olney, Nebraska; Ontario.
Carex Bicknellii Britton, Oklahoma.
Carex Bolanderi Olney, Washington.
Carex brevior (Dewey) Mackenzie (*C. festucacea* Am. Auct. p. p.), Indiana, Iowa, Kansas, Nebraska, North Dakota, South Dakota; Ontario.
Carex bromoides Schkuhr, Maine, West Virginia.
Carex bullata Schkuhr, New Jersey.
Carex cephalantha (L. H. Bailey) Bickn., Maine.
Carex cephaloidea Dewey, Wisconsin.
Carex cephalophora Muhl., Indiana, Iowa, Wisconsin; Ontario.
Carex communis L. H. Bailey, Michigan.
Carex Crawfordii Fernald, New York.
Carex cristatella Britton (*C. tribuloides cristata* L. H. Bailey), Nebraska, New York, Wisconsin.
Carex deflexa Hornem., Maine.
Carex densa L. H. Bailey, California.
Carex Deweyana Schw., Nova Scotia.
Carex diandra Schrank (*C. teretiusecula* Gooden.), Michigan, Nebraska.
Carex disperma Dewey (*C. tenella* Schkuhr), Michigan, New York, Washington, Wyoming; Nova Scotia, Ontario.
Carex festivella Mackenzie, Colorado, Utah.
Carex feta L. H. Bailey, California, Oregon.
Carex foenea Willd., Indiana, Iowa, Massachusetts, South Dakota; Ontario.
Carex gravida L. H. Bailey, Nebraska, North Dakota.
Carex Houghtonii Torr., New York.
Carex hyalina Boott, Texas.
Carex incompta Bickn., Delaware.
Carex interior L. H. Bailey, Nebraska, New York.
Carex Jamesii Schw. not Torr., Illinois, Indiana.
Carex laeviculmis Meinsh., Washington; British Columbia.
Carex leptalea Wahl., New York, Wisconsin.
Carex leptopoda Mackenzie, Oregon, Washington; British Columbia.
Carex Muhlenbergii Schkuhr, Arkansas, Delaware, Texas.
Carex muskingumensis Schw., Wisconsin.
Carex normalis Mackenzie, Indiana, Iowa.
Carex oligocarpa Schkuhr, Arkansas, Indiana.
Carex olympica Mackenzie, Oregon.
Carex pennsylvanica Lam., Indiana, Iowa, Michigan, New Jersey, New York, Pennsylvania, Wisconsin; Ontario.

- Carex planostachys* Kunze, Texas.
Carex praegracilis W. Boott (*C. marcida* Boott), Iowa.
Carex prairea Dewey, New York.
Carex radiata (Wahl.) Small, Delaware, Virginia.
Carex reniformis (L. H. Bailey) Small, Oklahoma.
Carex retrorsa Schw., Quebec.
Carex rosaeoides E. C. Howe (*C. seorsa* E. C. Howe), Delaware, New York.
Carex rosea Schkuhr, Delaware, Michigan, Vermont; Ontario.
Carex Rossii Boott, Colorado.
Carex scoparia Schkuhr, Connecticut, Maine, Nebraska, New York, Ohio, Pennsylvania, South Dakota; Nova Scotia, Ontario, Quebec.
Carex siccata Dewey, Colorado, Minnesota.
Carex sparganioides Muhl., Illinois, Indiana, Iowa, Kansas, Nebraska, New York, Virginia, Wisconsin; Ontario, Quebec.
Carex stipata Muhl., Delaware, Indiana, Iowa, Montana, Nebraska, New York, Ohio, Oregon, Wisconsin; Nova Scotia.
Carex subbracteata Mackenzie, California.
Carex suberecta (Olney) Britton, Virginia.
Carex subfusca W. Boott, Oregon.
Carex Swanii (Fernald) Mackenzie, New York.
Carex tenera Dewey (*C. straminea* Am. Auct.), Maine, New York, Pennsylvania; Ontario.
Carex triangularis Böck., Texas.
Carex tribuloides Wahl., Indiana, Michigan, Nebraska, New York, Ohio; Nova Scotia.
Carex trisperma Dewey, Maine, New York, Rhode Island; Nova Scotia.
Carex varia Muhl., Indiana, New York, Texas.
Carex viridula Michx., North Dakota.
Carex vulpinoidea Michx., Delaware, Indiana, Iowa, Michigan, New Jersey, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, Virginia, Wisconsin; Ontario, Quebec.
Carex Willdenovii Schkuhr, New York.
Carex sp., Arizona, Missouri, New Hampshire, New Mexico.
Dulichium arundinaceum (L.) Britton (*D. spathaceum* Pers.), Delaware, Florida, Indiana, Maryland, New Jersey, New York, Ohio, Pennsylvania, West Virginia, Wisconsin; Ontario.

TYPE LOCALITY: North Carolina, on smooth-leaved *Aster*.

DISTRIBUTION: Common from Nova Scotia and Virginia westward to the Pacific coast, and less common in the southern United States; also in South America and Europe.

ILLUSTRATIONS: Krypt.-fl. Brand. Pilze 3: f. B113.

EXSICCATI: Barth. Fungi Columb. 2302, 2366, 2448, 2574, 2656, 2662, 3250, 3251, 3352, 3454, 3455, 3547, 3548, 3743, 3744, 3801, 3839, 3862, 3932, 4053, 4054, 4142, 4143, 4257, 4258, 4274, 4455, 4564, 4565, 4755, 4766, 4848; Barth. N. Am. Ured. 25, 26, 226, 227, 228, 267, 334, 421, 534, 535, 623, 624, 625, 626, 651, 731, 732, 733, 775, 824, 825, 826, 827, 828, 829, 931, 976, 1029, 1030, 1031, 1032, 1135, 1136, 1137, 1138, 1139, 1140, 1180, 1226, 1337, 1442, 2034, 2139, 2140, 2230, 2231; Brenckle, Fungi Dakot. 107, 127, 241, 341, 341a, 364, 364a; Carleton, Ured. Am. 45; Clements, Crypt. Form. Colo. 692; Ellis, N. Am. Fungi 1018c, 1019; Ellis & Ev. Fungi Columb. 64, 866, 1391, 1502, 1667, 1705, 1707, 1708, 1847, 1955; Ellis & Ev. N. Am. Fungi 2402b; Garrett, Fungi Utah. 65, 66, 131, 155; D. Griff. W. Am. Fungi 277, 370; Kellerm. Ohio Fungi 89, 150, 151, 174; Rab.-Wint.-Paz. Fungi Eur. 3833b; Seym. & Earle, Econ. Fungi. B28; Shear, N. Y. Fungi 128; Sydow, Ured. 2132, 2386, 2411, 2412, 2450, 2514, 2515; Thüm. Myc. Univ. 151.

136. *Dicaeoma Peckii* (De-Toni) Arth. Proc. Ind. Acad. Sci. 1903: 149. 1904.

Aecidium Oenotherae Mont. in C. Gay, Fl. Chil. 8: 37. 1852. Not *Dicaeoma Oenotherae* Kuntze, 1898.

Aecidium Oenotherae Peck, Ann. Rep. N. Y. State Mus. 23: 60. 1873.

Aecidium Peckii De-Toni, in Sacc. Syll. Fung. 7: 790. 1888.

Aecidium Gaurae Ellis & Ev. Erythea 1: 205. 1893.

Puccinia ludibunda Ellis & Ev. Proc. Acad. Phila. 1893: 153. 1893.

Puccinia Peckii Kellerm. Jour. Myc. 8: 20. 1902.

O. Pycnia epiphyllous, few, gregarious, in small groups 0.5–1.5 mm. across, inconspicuous, honey-yellow becoming brownish, depressed-globoid, 100–128 μ in diameter by 75–100 μ high; ostiolar filaments 30–50 μ long.

I. Aecia chiefly hypophyllous, gregarious, numerous, crowded in orbicular groups 1.5–15 mm. across, on somewhat larger discolored spots, short, 0.2–0.4 mm. in diameter, bright-yellow; peridium colorless, the margin recurved, erose; peridial cells rhomboidal, 16–29 μ long, overlapping, the outer wall thick, 6–10 μ , striate, smooth, the inner wall moderately thick, 3–4 μ , moderately verrucose; aeciospores globoid, 14–21 μ in diameter; wall pale-yellow, thin, about 1 μ , finely verrucose.

ON ONAGRACEAE:

Gaura coccinea Pursh, Nebraska.

Gaura parviflora Dougl., Colorado, Nebraska.

Gaura sinuata Nutt., Texas.

Kneiffia perennis (L.) Pennell (*K. pumila* Spach, *Oenothera pumila* L.), Connecticut, New Hampshire.

Meriolix serrulata (Nutt.) Walp. (*Oenothera serrulata* Nutt.), Iowa, Nebraska, North Dakota, South Dakota.
Oenothera biennis L. (*Onagra biennis* Scop.), Illinois, Indiana, Iowa, Michigan, Nebraska, New Hampshire, New York, Ohio, Pennsylvania, West Virginia, Wisconsin; Manitoba.
Oenothera Hookeri T. & G., Arizona, California.
Oenothera strigosa (Rydb.) Mackenzie & Bush, Colorado. Idaho, Kansas, Minnesota, Nebraska, North Dakota, South Dakota.
Oenothera sp., Oklahoma, Virginia.
Pachylophus microglottis Rydb., Colorado.
Raimannia laciniata (Hill) Rose (*Oenothera laciniata* Hill), Alabama, Kansas, Nebraska.
Raimannia rhombipetala (Nutt.) Rose (*Oenothera rhombipetala* Nutt.), Nebraska.

II. Uredinia hypophyllous, scattered, oval or oblong, 0.1–0.2 mm. wide by 0.3–0.8 mm. long, early naked, somewhat pulverulent, light cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or obovate, 13–19 by 21–26 μ ; wall golden-brown, thin, 1–1.5 μ , finely echinulate, the pores 2, in the upper part.

III. Telia hypophyllous, scattered, roundish or oval, 0.2–0.5 mm. wide by 0.3–1 mm. or more long, soon naked, pulvinate, dark chocolate-brown, ruptured epidermis conspicuous; teliospores clavate-oblong, 13–19 by 32–55 μ , rounded or truncate above, usually narrowed at base, slightly constricted at septum; wall chestnut-brown, paler below, rather thin, about 1.5 μ , thicker at apex, 7–11 μ , smooth; pedicel one half to once length of spore, nearly colorless.

The species is morphologically similar to *D. Asterum* and *D. hieraciatum*, but in general may be separated from both of them by the aecial hosts, from *D. Asterum* by the larger urediniospores, and from *D. hieraciatum* by the more roundish telia and narrower teliospores with the lower cell similar in shape to the upper cell. No races have yet been detected.

ON CYPERACEAE:

Carex Asa-Grayi L. H. Bailey (*C. Grayi* Carey), Missouri.
Carex chordorrhiza Ehrh., Ontario.
Carex flexuosa Muhl., Maine.
Carex lacustris Willd., Maine.
Carex laeviconica Dewey, Indiana, Missouri.
Carex lanuginosa Michx., Indiana, Kansas, Nebraska, North Dakota, Ohio.
Carex Muhlenbergii Schkuhr, Wisconsin.
Carex occidentalis L. H. Bailey, Colorado.
Carex retrorsa Schw., New York.
Carex rostrata Stokes (*C. utriculata* Boott), Maine, Michigan, Vermont.
Carex scabrata Schw., Pennsylvania.
Carex siccata Dewey, North Dakota, Vermont.
Carex sparganioides Muhl., Indiana, Kansas, Wisconsin.
Carex trichocarpa Muhl., Illinois, Indiana, Iowa, New York, Ohio, Virginia, Wisconsin.
Carex tumulicola Mackenzie, Oregon.
Carex Willdenovii Schkuhr, Indiana, New York.
Carex sp., California; Manitoba.

TYPE LOCALITY: Knowersville, New York, on *Oenothera biennis*.

DISTRIBUTION: Maine to Virginia and Alabama, westward to the Pacific coast; especially abundant from Ohio to South Dakota and Kansas, and rare on the Pacific slope. On *Carex trichocarpa* often associated, even on the same leaf, with *Dicaeoma Sambuci*.

EXSICCATI: Barth. Fungi Columb. 2569, 2570, 3460, 3563, 3669, 3850, 3955, 3956, 4157; Barth. N. Am. Ured. 47, 53, 252, 560, 652, 759, 955, 1058, 1361, 1563, 1933; Brenckle, Fungi Dak. 65, 65a, 112, 186; Carleton, Ured. Am. 5; Ellis, N. Am. Fungi 1016; Ellis & Ev. Fungi Columb. 195, 654, 1191, 1604, 1651 (in part), 1907, 1954; Ellis & Ev. N. Am. Fungi 3243; Kellerm. Ohio Fungi 17, 28 (in part), 194 (in part); Sydow, Ured. 1176, 1576 (in part), 2325; Thümen, Myc. Univ. 1035.

137. *Dicaeoma hieraciatum* (Schw.) Arthur & Kern.

Caeoma (*Aecidium*) *hieraciatum* Schw. Trans. Am. Phil. Soc. II. 4: 292. 1832.
Aecidium (*Caeoma*) *hieraciatum* Schw. Trans. Am. Phil. Soc. II. 4: 309. 1832.
Aecidium compositarum Lactucae Burrill; De-Toni, in Sacc. Syll. Fung. 7: 799. 1888.
Puccinia Opizii Arth. Jour. Myc. 13: 194. Not *P. Opizii* Bubák, 1902.
Puccinia patruelis Arth. Mycologia 1: 245. 1909.
Dicaeoma patruelis H. S. Jackson, Proc. Ind. Acad. Sci. 1915: 455. 1916.
Puccinia hieraciata H. S. Jackson, Brooklyn Bot. Gard. Mem. 1: 251. 1918.

O. Pycnia amphigenous, gregarious, the groups sometimes up to 5 mm. across, golden-yellow becoming reddish-brown, globoid, 85–125 μ in diameter; ostiolar filaments 30–60 μ long.

I. Aecia amphigenous or chiefly hypophyllous, in annular or crowded groups 1–7 mm. or more across which are sometimes adjacent and confluent over considerable areas, cupulate, short, 0.2–0.3 mm. in diameter; peridium colorless, the margin somewhat recurved, finely lacerate; peridial cells rhomboidal, 18–27 μ long, the outer wall 5–7 μ thick, striate, the inner wall thinner, 3–5 μ , finely verrucose; aeciospores globoid, 13–20 by 16–23 μ ; wall colorless, thin, 1 μ , very finely verrucose.

ON CICHORIACEAE:

- Adopogon virginicus* (L.) Kuntze (*Cynthia virginica* D. Don, *Krigia amplexicaulis* Nutt.), Illinois, Iowa, Wisconsin.
Agoseris aspera Rydb., Colorado.
Agoseris aurantiaca (Hook.) Greene (*Troximon aurantiacum* Hook.), Colorado.
Agoseris glauca (Nutt.) Greene (*Troximon glaucum* Nutt.), Colorado.
Agoseris gracilens (A. Gray) Greene, Colorado.
Agoseris montana Osterhout, Colorado.
Agoseris sp., Montana.
Crepis riparia A. Nelson, Montana, Nebraska.
Crepis runcinata (James) T. & G., Montana, Nebraska.
Hieracium albiflorum Hook., British Columbia.
Hieracium canadense Michx., Illinois.
Hieracium columbianum Rydb., Minnesota.
Hieracium gracile Hook., Montana.
Hieracium paniculatum L., Pennsylvania.
Hieracium scabrum Michx., Wisconsin.
Lactuca canadensis L., Illinois, Indiana, Iowa, Michigan, New York, South Dakota, Wisconsin.
Lactuca floridana (L.) Gaertn., Nebraska.
Lactuca graminifolia Michx., Colorado.
Lactuca hirsuta Muhl., New York.
Lactuca ludoviciana (Nutt.) DC., Iowa, Nebraska.
Lactuca pulchella (Pursh) DC. (*Mulgedium pulchellum* T. & G.), Colorado, Iowa, Nebraska, North Dakota, South Dakota.
Lactuca sagittifolia Ell., Michigan.
Lactuca sativa L., Connecticut, Indiana, Wisconsin.
Lactuca spicata (Lam.) Hitchc., Wisconsin; British Columbia.
Lactuca virosa L., Indiana, New York, North Dakota.
Lactuca sp., Idaho; Nova Scotia.
Nabalus albus (L.) Hook., Illinois, New York, Wisconsin.
Nabalus crepidineus (Michx.) DC., Wisconsin.
Nabalus trifoliolatus Cass., Virginia.
Scorzonella borealis (Bong.) Greene, Alaska.

II. Uredinia chiefly hypophyllous, scattered, oval or oblong, 0.4–0.6 mm. long, rather early naked, cinnamon-brown, pulverulent, ruptured epidermis noticeable; urediniospores ellipsoid or obovoid, 14–20 by 20–26 μ ; wall golden-brown, about 1.5 μ thick, moderately echinulate, the pores 2, in the upper part of the spore.

III. Telia hypophyllous, scattered, oval, oblong, or linear, 0.3–1.5 mm. or more long, early naked, pulvinate, conspicuous, blackish-brown, ruptured epidermis noticeable; teliospores narrowly clavate or clavate-oblong, 15–22 by 32–59 μ , rounded or truncate above, slightly or not constricted at septum; wall chestnut-brown, somewhat paler below, 1–1.5 μ thick, much thicker at apex, 5–13 μ , smooth; pedicel tinted next to spore, about three fourths length of spore.

The species is morphologically similar to the two preceding species, *D. Asterum* and *D. Peckii*, but in general may be separated from both of them by the aecial hosts, from *D. Asterum* by the larger urediniospores, and from *D. Peckii* by the more elongate telia and broader teliospores with the lower cell narrower than the upper cell, giving a somewhat obovate or clavate appearance to the spore. No races have yet been detected.

ON CYPERACEAE:

- Carex aenea* Fernald, Minnesota.
Carex brunnescens (Pers.) Poir., British Columbia.
Carex Frankii Kunth, Missouri.
Carex grisea Wahl., Iowa.
Carex Hoodii Boott, Utah.
Carex illota L. H. Bailey, Colorado.
Carex lupulina Muhl., Missouri.
Carex olympica Mackenzie, Oregon.
Carex praegracilis W. Boott (*C. marcida* Boott), Colorado, North Dakota, Oregon, South Dakota.
Carex praticola Rydb. (*C. pratensis* Drejer), Colorado, Montana, Wyoming.
Carex Reynoldsii Dewey, Wyoming.
Carex Sartwellii Dewey, Michigan, Minnesota.
Carex siccata Dewey, Colorado, Iowa, Montana, Wisconsin.
Carex sparganioides Muhl., New York.
Carex Sprengelii Dewey (*C. longirostris* Torr.), Minnesota.
Carex sp., California, Indiana.

TYPE LOCALITY: Bethlehem, Pennsylvania, on *Hieracium paniculatum*.

DISTRIBUTION: Nova Scotia and Virginia across the continent to southeastern Alaska and Utah, but most common on the plains of the upper Mississippi valley and in the eastern Rocky Mountains.

EXSICCATI: Barth. Fungi Columb. 3070, 3101, 3765, 3953, 3954, 4366, 4860; Barth. N. Am. Ured. 702, 758, 954, 1065, 1066, 1165, 1264, 1961; Brenckle, Fungi Dak. 111, 111a, b, 242, 417; Clements, Crypt. Form. Colo. 314; Ellis & Ev. Fungi Columb. 1601, 1902; Ellis & Ev. N. Am. Fungi 2993, 3054; D. Griff. W. Am. Fungi 277c, 339a, 372a; Seym. & Earle, Econ. Fungi 484; Sydow, Ured. 2323.

138. *Dicaeoma Sambuci* (Schw.) Arth. Proc. Ind. Acad. Sci. 1903:
151. 1904.

Aecidium Sambuci Schw. Schr. Nat. Ges. Leipzig 1: 67. 1822.

Caeoma (Aecidium) sambuciatum Schw. Trans. Am. Phil. Soc. II. 4: 294. 1832.

Puccinia Bolleyana Sacc. Syll. Fung. 9: 303. 1891.

Puccinia Atkinsoniana Dietel, Bull. Cornell Univ. 3: 19. 1897.

Dicaeoma Bolleyanum Kuntze, Rev. Gen. 3³: 468. 1898.

Puccinia Thompsonii Hume, Bot. Gaz. 29: 352. 1900.

Puccinia Sambuci Arth. Bot. Gaz. 35: 15. 1903.

O. Pycnia chiefly epiphyllous and caulicolous, numerous, gregarious, more or less crowded in orbicular groups 1–5 mm. across, conspicuous, punctiform, orange-yellow becoming brownish, globoid, 120–155 μ in diameter, 112–144 μ high; ostiolar filaments 50–90 μ long.

I. Aecia hypophyllous and caulicolous, crowded in orbicular groups on the leaves, 0.1–0.5 mm. or more across, on thickened, discolored spots, or crowded over hypertrophied areas, often of considerable extent on the stems and petioles, short, 0.3–0.7 mm. in diameter, bright orange-yellow; peridium colorless, the margin recurved, erose; peridial cells squarish in longitudinal section, isodiametric, 15–25 μ , the outer wall 7–12 μ thick, striate, smooth, the inner wall moderately thick, 3–4 μ , verrucose; aeciospores globoid, 15–19 μ in diameter; wall pale-yellow, thin, about 1 μ , finely verrucose.

ON CAPRIFOLIACEAE:

Sambucus canadensis L., Alabama, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Louisiana, Massachusetts, Michigan, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Virginia, West Virginia, Wisconsin.

Sambucus pubens Michx. (*S. racemosa* Hook. not L.), Delaware, District of Columbia, Indiana, Michigan.

II. Uredinia chiefly hypophyllous, scattered, elliptic, 0.1–0.3 mm. broad by 0.2–0.7 mm. long, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; urediniospores lenticular or ellipsoid, 17–21 by 23–32 μ ; wall light chestnut-brown, about 1.5 μ thick, rather finely echinulate, the pores 2, usually in the upper part near apex.

III. Telia chiefly hypophyllous, scattered, oblong or linear-oblong, 0.3–0.6 mm. broad by 0.4–5 mm. or more long, early naked, pulvinate, dark chocolate-brown, ruptured epidermis conspicuous; teliospores clavate-oblong or clavate, 15–25 by 42–65 μ , rounded above, usually narrowed below, somewhat constricted at septum; wall chestnut-brown, concolorous, 1.5–2 μ thick, thicker at apex, 7–13 μ , smooth; pedicel nearly or quite colorless, about length of spore.

ON CYPERACEAE:

Carex Asa-Grayi L. H. Bailey (*C. Grayi* Carey), West Virginia.

Carex bullata Schkuhr, Delaware.

Carex comosa Boott, Michigan, Ohio, Texas.

Carex crinita Lam., New York.

Carex Crus-corvi Shuttl., Michigan.

Carex Frankii Kunth (*C. stenolepis* Torr.), Arkansas, Georgia, Indiana, Kansas, Kentucky, Missouri, Ohio, Tennessee, West Virginia.

Carex intumescens Rudge, Nova Scotia.

Carex lupulina Muhl., Indiana, New York.

Carex lupuliformis Sartwell, Ontario.

Carex lurida Wahl., Alabama, Delaware, Indiana, New York, Ohio, Pennsylvania.

Carex tribuloides Wahl., New York.

Carex trichocarpa Muhl., Indiana, Ohio, Wisconsin.

Carex sp., Illinois, New Jersey, North Carolina, Virginia.

TYPE LOCALITY: North Carolina, on *Sambucus canadensis*.

DISTRIBUTION: Throughout the United States and southern Canada east of the Rocky Mountains.

EXSICCATI: Barth. Fungi Columb. 3351, 3860, 4865; Barth. N. Am. Ured. 1569, 2263; Ellis, N. Am. Fungi 1002; Ellis & Ev. Fungi Columb. 258 (in part); Kellerm. Ohio Fungi 3, 57, 88, 148; Rab.-Wint.-Paz. Fungi Eur. 3937; Rav. Fungi Am. 725; Seym. & Earle, Econ. Fungi 475a, b.

139. *Dicaeoma Caricis-strictae* (Dietel) Arthur & Kern.

Uromyces Caricis Peck, Ann. Rep. N. Y. State Mus. 24: 90. 1872. Not *Dicaeoma Caricis* Kuntze, 1898.

Puccinia Caricis-strictae Dietel, Hedwigia 28: 23. 1889.

O and I. Pycnia and aecia unknown.

II. Uredinia of the usual sort not seen; urediniospores of the usual sort ellipsoid or obovoid, 13–20 by 20–35 μ ; wall light cinnamon-brown, about 1.5 μ thick, finely and moderately echinulate, the pores 2, opposite, slightly below the equator.

Uredinia of the modified sort (amphisori) hypophyllous, scattered, roundish, oval, or oblong, 0.3–0.8 mm. long, early naked, pulvinate, chestnut-brown, ruptured epidermis not conspicuous; urediniospores of the modified sort (amphisporae) globoid, obovoid, or ellipsoid, 17–24 by 21–31 μ ; wall dark cinnamon-brown, uniform, 1.5–2.5 μ thick, finely verrucose, the pores 2, opposite, slightly below the equator; pedicel colorless, semi-persistent, once to twice length of spore.

III. Telia hypophyllous, scattered, oval, or oblong, 0.4–1 mm. long, early naked, pulvinate, blackish-brown, ruptured epidermis noticeable; teliospores clavate-oblong, 16–21 by 32–56 μ , usually rounded above, narrowed or rounded below, slightly constricted at septum; wall light chestnut-brown, 1–1.5 μ thick, much thicker above, 5–10 μ , smooth; pedicel nearly colorless, length of spore or less.

ON CYPERACEAE:

Carex stricta L. (?), Connecticut, Delaware, Massachusetts, New York.

TYPE LOCALITY: Center (now called Karner), New York, on *Carex stricta*.

DISTRIBUTION: Massachusetts and adjacent part of New York south to Delaware.

EXSICCATI: Barth. N. Am. Ured. 1033; Thüm. Myc. Univ. 746.

140. *Dicaeoma Trientalis* (Tranz.) Arthur & Kern.

Aecidium Trientalis Tranz.; Gobi & Tranz. Scripta Bot. Hort. Imp. Petrop. 3: 116. 1891.

Puccinia karelica Tranz. Trav. Mus. Bot. Acad. Sci. St.-Petersb. 2: 16. 1905.

O. Pycnia not seen, probably rarely formed.

I. Aecia hypophyllous, gregarious, in irregular groups 1–4 mm. across, cupulate, about 0.2 mm. in diameter; peridium delicate, recurved and lacerate at margin; peridial cells rhomboidal, 24–32 μ long, somewhat overlapping, the outer wall rather thick, 5–8 μ , striate, the inner wall thinner, 3–4 μ , verrucose; aeciospores angularly globoid, 13–16 by 15–21 μ ; wall colorless, thin, 1–1.5 μ , finely verrucose.

ON PRIMULACEAE:

Trientalis americana Pursh, New York; Nova Scotia.

Trientalis arctica Fisch., Alaska.

II. Uredinia chiefly hypophyllous, scattered, oval or elliptic, 0.3–0.6 mm. long, rather early naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 16–19 by 20–24 μ ; wall cinnamon-brown, 2–2.5 μ thick, finely and moderately echinulate, the pores 3–5, scattered.

III. Telia chiefly hypophyllous, scattered, oval, oblong or linear, 0.4–1.5 mm. or more long, early naked, pulvinate, blackish, ruptured epidermis conspicuous; teliospores clavate-oblong, 13–21 by 26–48 μ , usually rounded above, rounded or narrowed below, slightly constricted at septum; wall chestnut-brown, 1–1.5 μ thick, much thicker above, 7–12 μ , smooth; pedicel tinted, about one half length of spore.

ON CYPERACEAE:

Carex canescens L., New York, Vermont.

Carex diandra Schkuhr, New York.

Carex paupercula Michx. (*C. paupercula irrigua* Fernald, *C. magellanica* Am. Auct.), Maine, New York, Wisconsin; Nova Scotia.

Carex strictior Dewey, Michigan.

TYPE LOCALITY: Lewaschewo, St. Petersburg, Russia, on *Trientalis europaea*.

DISTRIBUTION: Boreal habitats from Nova Scotia to northern New York and Wisconsin, and in southeastern Alaska; also in northern Europe.

141. *Dicaeoma* (?) *Pitcairniae* (Lagerh.) Arthur.

Puccinia Pitcairniae Lagerh.; Pat. & Lagerh. Bull. Soc. Myc. Fr. 11: 214. 1895.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oblong or linear, 0.2–0.7 mm. long, rather early naked, pulverulent, light cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or broadly obovoid, 21–27 by 26–32 μ ; wall pale-yellow or golden-brown, thick, 2.5–5 μ , often showing two layers, the inner colored, the outer thin and colorless, coarsely and moderately echinulate, the pores 2, equatorial.

III. Telia hypophyllous, scattered, oval or oblong, 0.3–1 mm. long, rather early naked, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores oblong, broadly ellipsoid or broadly obovoid, 19–27 by 37–53 μ , rounded at both ends or slightly narrowed

below, slightly or not constricted at septum; wall chestnut-brown, 2–5 μ thick, much thicker at apex, 7–12 μ , smooth; pedicel slightly tinted, from one-half to twice length of spore; mesospores few, obovoid, 21–23 by 27–35 μ ; wall chestnut-brown, 2.5–3 μ thick, thicker at apex, 7–9 μ , smooth.

ON BROMELIACEAE:

Pitcairnia Palmeri S. Wats., Jalisco.

TYPE LOCALITY: Panoptico, near Quito, Ecuador, on *Pitcairnia* sp.

DISTRIBUTION: Southern Mexico; also in South America.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 5, f. 23.

EXSICCATI: Barth. Fungi Columb. 4065; Barth. N. Am. Ured. 359.

142. *Dicaeoma* (?) *Commelinae* (Holway) Arthur.

Puccinia Commelinae Holway, Ann. Myc. 2: 393. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, circular or oval, 0.1–1 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 19–26 by 23–30 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately or sparsely echinulate, the pores 2, equatorial.

III. Telia hypophyllous, crowded, usually circinating about the uredinia, round, small, 0.1–0.3 mm. in diameter, tardily naked, compact, blackish-brown, ruptured epidermis inconspicuous; stroma surrounding the telium, thin, chestnut-brown; teliospores irregularly clavate or oblong-clavate, 15–23 by 35–71 μ , rounded, obtuse or acute above, narrowed below, slightly constricted at septum; wall cinnamon-brown below, chestnut-brown above, thin, 1–2 μ , thicker above, 3–10 μ , smooth; pedicel colorless or slightly tinted, short, up to 10 μ long, fragile.

ON COMMELINACEAE:

Commelina coelestis Willd., Oaxaca.

Commelina graminifolia H.B.K., Morelos.

Commelina pallida Willd., Jalisco, Morelos.

Commelina tuberosa L., Jalisco.

Commelina sp., Mexico (state).

TYPE LOCALITY: Guadalajara, Mexico, on *Commelina* sp.

DISTRIBUTION: Southern Mexico.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 5, f. 24.

EXSICCATI: Barth. N. Am. Ured. 31, 984.

143. *Dicaeoma obscurum* (Schroet.) Kuntze, Rev. Gen. 3³: 469.

1898.

Aecidium compositarum Bellidis Westend.; Westend. & Wallr. Herb. Crypt. Belg. 837, hyponym. 1854.

Aecidium Bellidis Thüm. Fungi Austr., 635, hyponym. 1873.

Puccinia obscura Schroet.; Pass. Nuovo Giorn. Bot. Ital. 9: 256. 1877.

Puccinia Bellidis Lagerh. Bol. Soc. Broter. 8: 134. 1890.

Puccinia Luzulae-maximae Dietel, Ann. Myc. 17: 57. 1919.

O. Pycnia amphigenous, numerous, scattered, honey-yellow, becoming brownish, globoid, 90–140 μ wide by 110–150 μ high; ostiolar filaments short, not protruding above the epidermis.

I. Aecia amphigenous, numerous, scattered or loosely gregarious, cupulate, 0.2–0.4 mm. in diameter; peridium whitish, erect, the margin entire or lacerate; peridial cells rhomboidal, 20–28 by 25–35 μ , abutted, the outer wall rather thick, 7–9 μ , transversely striate, the inner wall thinner, 3–5 μ , moderately verrucose; aeciospores globoid or angular, 15–19 by 16–22 μ ; wall light-yellow or colorless, rather thin, 1–1.5 μ , moderately verrucose.

ON CARDUACEAE:

Bellis perennis L., in Europe; not yet found in America.

II. Uredinia amphigenous, often chiefly hypophyllous, or caulicolous, numerous, scattered, oval or oblong, 0.2–0.6 by 0.3–1 mm., rather early naked, pulverulent, golden- or cinnamon-brown, ruptured epidermis noticeable; urediniospores ellipsoid, ovate or globoid, 16–24 by 24–30 μ ; wall golden-brown, moderately thick, 1.5–2 μ , bluntly and rather coarsely echinulate, the pores 2, superequatorial.

III. Telia hypophyllous, amphigenous, or caulicolous, numerous, scattered, roundish, oval or oblong, 0.2–0.5 by 0.3–1 mm., rather early naked, compact, becoming pulverulent, cinnamon- or chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or clavate, 14–20 by 32–45 μ (western forms 16–22 by 35–55 μ), rounded or occasionally truncate above, narrowed below, usually constricted at septum; wall golden- or very light chestnut-brown, moderately thin, 1.5–2 μ , thicker above, 6–10 μ , smooth; pedicel concolorous, as long as spore or less.

ON JUNCACEAE:

Juncoides Carolinae (S. Wats.) Kuntze (*Luzula Carolinae* S. Wats., *L. saltuensis* Fernald), New York; Nova Scotia, Ontario.

Juncoides comosum (E. Meyer) Sheldon, Oregon.

Juncoides intermedium (Thuill.) Rydb. (*Luzula intermedia* A. Nelson, *L. campestris* Am. Auct.), Idaho, Indiana, Iowa, Maine, Massachusetts, Michigan, New York, Vermont, Wisconsin; Nova Scotia.

Juncoides parviflorum (Ehrh.) Coville (*Luzula parviflora* Desv.), Idaho, Oregon, Washington; British Columbia.

TYPE LOCALITY: Near Parma, Italy, on *Luzula campestris*.

DISTRIBUTION: Canada and northern United States; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 187; Holway, Ured. 1: pl. 5, f. 25; Krypt.-fl. Brand. Pilze 3: f. 91.

EXSICCATI: Barth. N. Am. Ured. 558, 1462; Ellis, N. Am. Fungi 1469; Seym. & Earle, Econ. Fungi 53.

144. *Dicaeoma Veratri* (DC.) Kuntze, Rev. Gen. 3³: 471. 1898.

Uredo Veratri DC.; Poir. in Lam. Encyc. 8: 224. 1808.

Puccinia Veratri Duby, Bot. Gall. 890. 1830.

Puccinia Veratri Niessl, Verh. Zool.-Bot. Ges. Wien 9: 177. 1859.

Puccinia Veratri Clinton; Peck, Rep. N. Y. State Mus. 27: 103. 1875.

O. Pycnia hypophyllous, scattered between the aecia, immersed, becoming brownish, globoid or flask-shaped, rather large, 112–144 μ broad by 128–175 μ high; ostiolar filaments 55–65 μ long; pycniospores many, oval, 0.5–1 by 1–3 μ .

I. Aecia hypophyllous, numerous, crowded often over the entire lower surface of the leaf, broadly cupulate, 0.3–0.6 mm. in diameter; peridium white, much recurved, the margin lacerate; peridial cells rhomboidal or oblong, 16–21 by 21–30 μ , somewhat overlapping, the outer wall 3–5 μ thick, the inner wall 3–6 μ , verrucose; aeciospores roundish or oval, 14–18 by 16–24 μ ; wall light-yellow, thin, 1 μ , finely verrucose.

ON ONAGRACEAE:

Chamaenerion latifolium (L.) Sweet (*Epilobium latifolium* L.), British Columbia.

Epilobium alpinum L., Montana, New Hampshire, Utah.

Epilobium anagallidifolium Lam., Montana.

Epilobium Hornemannii Reichenb., Utah; British Columbia.

Epilobium paniculatum Nutt., Idaho, Washington.

Epilobium rubescens Rydb., Utah.

Epilobium sp., Oregon.

II. Uredinia amphigenous or hypophyllous, scattered, round or oval, small, 0.2–0.5 mm. broad by 0.2–1 mm. long, early naked, light cinnamon-brown, pulverulent, ruptured epidermis conspicuous; urediniospores globoid or obovate-globoid, 17–23 by 20–28 μ ; wall golden-brown, rather thin, 1.5–2 μ , moderately echinulate with blunt points, the pore 1, lateral or subequatorial.

III. Telia amphigenous or hypophyllous, many, scattered, round or oval, 0.3–0.6 mm. broad by 0.3–1.5 mm. long, early naked, cinnamon-brown, pulverulent, ruptured epidermis conspicuous; teliospores ellipsoid, 17–23 by 25–46 μ , rounded at base and apex, both cells usually globoid and inclined to separate; wall cinnamon-brown, uniformly thick, 1–2.5 μ , echinulate-verrucose with low points, the pore of the upper cell usually discernable, apical, often covered with a low hyaline papilla, the pore of the lower cell often midway; pedicel colorless, fragile or deciduous.

ON MELANTHACEAE:

Veratrum Eschscholtzianum (R. & S.) Rydb., Idaho, Oregon; British Columbia.

Veratrum speciosum Rydb. (*V. californicum* S. Wats. not Durand), California, New Mexico, Oregon, Utah, Washington; British Columbia.

Veratrum tenuipetalum A. Heller, Colorado.

Veratrum viride Ait., Connecticut, New Hampshire, New Jersey, New York, Pennsylvania, West Virginia.

TYPE LOCALITY: France, on *Veratrum album*.

DISTRIBUTION: Western North America, and New Hampshire to West Virginia, in mountainous districts; also in Europe.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl.* 6, *f.* 27.

EXSICCATI: Barth, N. Am. Ured. 68, 172, 436, 577, 1477; Ellis & Ev. Fungi Columb. 489; Ellis, N. Am. Fungi 1031; Garrett, Fungi Utah. 82, 135, 159; Sydow, Ured. 1386, 1783; Thüm. Myc. Univ. 733.

145. *Dicaeoma atropunctum* (Peck & Clinton) Kuntze, Rev. Gen.

3³: 468. 1898.

Puccinia atropuncta Peck & Clinton; Peck, Bot. Gaz. 4: 171. 1879.

Puccinia Zygadeni Trel. Prel. List Wisc. Fungi 25. 1884.

Uredo Schoenocauli Ellis & Ev. Bull. Torrey Club 22: 438. 1895.

Puccinia Melanthi Bubák, Oesterr. Bot. Zeits. 50: 318. 1900.

O. Pycnia amphigenous, numerous, in circular groups, punctiform, inconspicuous, immersed, honey-yellow becoming brownish, globoid, small, 80–110 μ broad by 80–120 μ high; ostiolar filaments 20–30 μ long.

I. Aecia amphigenous, rather crowded in circular or elliptic groups, short-cylindric, 0.2–0.4 mm. across; peridium white, the margin erect, lacerate; peridial cells oblong, 10–13 by 23–32 μ , overlapping, the outer wall 3–4 μ thick, transversely striate, the inner wall thinner, 2–3 μ , verrucose; aeciospores globoid or ellipsoid, 16–23 by 19–26 μ ; wall colorless or nearly so, thin, 1 μ , minutely verrucose.

II. Uredinia amphigenous or only hypophyllous, scattered, many, roundish or oval, small, 0.2–0.6 mm. long, tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or ellipsoid, 16–22 by 19–26 μ ; wall golden-brown, rather thin, 1–2 μ , moderately echinulate, the pores 2, usually superequatorial.

III. Telia amphigenous or only hypophyllous, scattered, roundish or oval, small, 0.2–0.8 mm. long, early naked, conspicuous, compact, becoming pulverulent, blackish, ruptured epidermis conspicuous; teliospores oblong or oblong-clavate, 14–22 by 35–56 μ , rounded or obtuse above, narrowed below, slightly constricted at septum; wall cinnamon-brown, rather thin, 1–2 μ , greatly thickened and darker-colored at apex, 7–12 μ , smooth; pedicel colored, about one half as long as spore.

ON MELANTHACEAE:

Anticlea chlorantha (Richards.) Rydb. (*Zygadenus glaucus* Nutt.), Iowa, North Dakota, Wisconsin.

Chrosperma muscaetoxicum (Walt.) Kuntze (*Amianthium muscaetoxicum* A. Gray), Pennsylvania.

Schoenocaulon dubium (Michx.) Small (*S. gracile* A. Gray), Florida.

Stenanthium gramineum (Ker) Morong, Georgia.

Veratrum parviflorum Michx. (*Melanthium parviflorum* S. Wats.), North Carolina, Tennessee.

Veratrum viride Ait., West Virginia.

Veratrum Woodii Robbins, Missouri.

Xerophyllum asphodeloides (L.) Nutt., Mississippi.

TYPE LOCALITY: Allenton, Missouri, on *Veratrum Woodii*.

DISTRIBUTION: From the Atlantic to the plains east of the Rocky mountains; also in Japan.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl.* 6, *f.* 26A, B, C; Oesterr. Bot. Zeits. 50: *pl.* 9, *f.* 10–13.

EXSICCATI: Ellis, N. Am. Fungi 1447; Rab.-Wint. Fungi Eur. 3218; Rab-Wint.-Paz. Fungi Eur. 3920; Roum. Fungi Gall. 3412.

146. *Dicaeoma grumosum* (Sydow & Holway) Arth. Résult. Sci.

Congr. Bot. Vienne 334. 1906.

Puccinia grumosa Sydow & Holway; Sydow, Monog. Ured. 1: 641. 1903.

O. Pycnia chiefly hypophyllous, few, loosely gregarious, inconspicuous, becoming dark-brown, globoid or flask-shaped, 95–130 μ in diameter by 90–120 μ high; ostiolar filaments 50–64 μ long.

I. Aecia chiefly hypophyllous, solitary or gregarious in small irregular groups on yellow spots, cupulate, sometimes oval in surface view, 0.3–0.4 mm. in diameter; peridium white, the margin reflexed, incised; peridial cells rhomboidal, 18–27 by 25–37 μ , the outer wall thick, 7–12 μ , transversely striate, the inner wall thinner, 3–6 μ , verrucose; aeciospores globoid, ellipsoid or angular, 19–23 by 19–28 μ ; wall pale-yellow, 1–2 μ thick, minutely verrucose.

II. Uredinia amphigenous, scattered, roundish or oblong, 0.1–0.5 by 0.1–1.5 mm., tardily naked, somewhat pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or ellipsoid, 18–26 by 22–32 μ ; wall light-yellow or golden-brown, moderately thick, 1–2 μ , sometimes 2.5 μ , moderately echinulate with low points, the pores 5–10, scattered.

III. Telia amphigenous, scattered, roundish or irregular, 0.1–0.5 by 0.1–1.5 mm., long covered by the gray, tenacious epidermis, compact, becoming pulverulent, blackish, ruptured epidermis conspicuous; teliospores ellipsoid or irregular, 20–30 by 32–50 μ , rounded or truncate above, rounded or narrowed below, slightly constricted at septum; wall dark cinnamon- or chestnut-brown, uniformly thick, 1.5–2.5 μ , smooth; pedicel pale, fragile; mesospores few.

This species morphologically is equivalent to *Nigredo Zygaeni* (Peck) Arth., except in the possession of two-celled teliospores. The two forms are separately maintained only for convenience, and should eventually be united under one name.

ON MELANTHACEAE:

Anticlea elegans (Pursh) Rydb. (*Zygaenus elegans* Pursh), Alberta.

Stenanthium occidentale A. Gray, Oregon.

Toxicoscordion gramineum Rydb. (*Zygaenus intermedius* Rydb.), Wyoming.

TYPE LOCALITY: Banff, Alberta, Canada, on *Zygaenus elegans*.

DISTRIBUTION: Northwestern North America.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 6, f. 28a, b.

EXSICCATI: D. Griff. W. Am. Fungi 288.

147. *Dicaeoma mutabile* (Ellis & Gall.) Kuntze, Rev. Gen. 3³:

469. 1898.

Puccinia mutabilis Ellis & Gall. Jour. Myc. 5: 67. 1889.

O. Pycnia amphigenous, scattered or in small groups, punctiform, honey-yellow, becoming brownish, globoid, 75–150 μ in diameter.

I. Aecia amphigenous, closely grouped in orbicular or elongate clusters on brownish spots, cupulate-cylindric, 0.2–0.4 mm. in diameter; peridium yellowish or whitish, the margin recurved; peridial cells rhomboidal, 19–25 by 25–30 μ , overlapping, the outer wall transversely striate, rather thick, 5–10 μ , the inner wall serrate or granular, thinner, 3–6 μ ; aeciospores globoid or angular, 15–23 by 18–27 μ ; wall light-yellow, 1.5–2.5 μ thick, finely verrucose.

II. Uredinia amphigenous, scattered, oval or oblong, 0.2–0.5 by 0.4–1 mm. or more; rather early naked, dehiscent by a longitudinal rupture, pulverulent, orange yellow, ruptured epidermis conspicuous; urediniospores ellipsoid or obovate, 18–23 by 24–32 μ ; wall yellow, rather thin, 1–2 μ , finely echinulate, the pores 4–8, scattered.

III. Telia amphigenous or caulicolous, many, scattered, or confluent in lines, linear or oblong, individual sori 0.2–1 by 0.3–2 mm., confluent often to 1 cm. or more, rather tardily naked, dehiscent by a longitudinal split of the epidermis, pulverulent, lead-colored or chocolate-brown, ruptured epidermis conspicuous; stroma absent; teliospores ellipsoid or variable in shape, 19–26 by 27–42 μ , usually rounded above and below, slightly constricted at septum; wall cinnamon-brown, uniformly thick, 1.5–2.5 μ , smooth; pedicel pale, short; mesospores very few, less than 1 per cent., ellipsoid or pyriform, 16–23 by 20–32 μ ; wall 1.5–2.5 μ thick, uniform; pedicel light-yellow, short.

This species agrees essentially with *Nigredo aemula* Arth., except in the possession of teliospores that are chiefly two-celled. The two forms are maintained separately for convenience, but should eventually be united under one name.

ON ALLIACEAE:

Allium brevistylum S. Wats., Wyoming.

Allium Geyeri S. Wats., Oregon, South Dakota, Washington.

Allium textile Nelson & Macbr. (*A. reticulatum* Fraser), Colorado, Montana, Washington.

TYPE LOCALITY: Sand Coulee, Montana, on "*Allium mutabile*," error for *A. textile*.

DISTRIBUTION: Western North America, in mountainous districts.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 6, f. 29a, b.

EXSICCATI: Barth. Fungi Columb. 3764; Barth. N. Am. Ured. 1356.

148. *Dicaeoma Allii* (DC.) Kuntze, Rev. Gen. 3³: 467. 1898.

Xyloma Allii DC. Fl. Fr. 6: 156. 1815.

Puccinia Allii Rudolphi, Linnaea 1: 392. 1829.

Puccinia Alliorum Corda, Ic. Fung. 4: 12. 1840.

Puccinia rotundata Bon. Abh. Nat. Ges. Halle 5: 219. 1860.

Puccinia Blasdalei Dietel & Holway; Dietel, Erythea 1: 248. 1893.

O. Pycnia amphigenous, crowded in small groups 1–2 mm. across, rather inconspicuous, honey-yellow or light-brown, flattened-globoid, 93–112 μ wide by 58–77 μ high; ostiolar filaments short, up to 70 μ long, slightly projecting beyond the ostiole.

I. Aecia amphigenous, crowded in small groups, cupulate, 0.1–0.2 mm. in diameter; peridium yellowish, the margin recurved, erose; peridial cells rhomboidal or rectangular, 10–23 by 16–30 μ , overlapping, the outer wall nearly smooth, transversely striate, 3–9 μ thick, the inner wall closely and finely verrucose, 2.5–5 μ thick; aeciospores globoid, oblong or angular, 15–24 by 18–30 μ ; wall hyaline or light-yellow, 1.5–2.5 μ thick, closely and finely verrucose.

II. Uredinia amphigenous or caulicolous, scattered, often surrounded by telia, round or elliptic, 0.3–0.7 mm. wide by 0.4–1 mm. long, sometimes confluent making sori 2–3 mm. long, tardily naked, opening by a longitudinal slit, yellow; urediniospores broadly ellipsoid or obovoid, 20–26 by 23–32 μ ; wall yellow, 1–2.5 μ thick, finely and closely echinulate, the pores 8–14, scattered, usually indistinct, even in lactic acid.

III. Telia amphigenous or caulicolous, often confluent entirely covering portions of the stem, irregular or oblong, 0.3–1 mm. wide by 0.5–4 mm. long, tardily naked or remaining covered, blackish or grayish-black, ruptured epidermis evident; stroma usually dense, well defined, cinnamon- or golden-brown, sometimes only slightly developed; teliospores clavate or ellipsoid, 16–30 by 40–74 μ , truncate or rounded above, obtuse or narrowed below, constricted at septum; wall cinnamon-brown below, chestnut-brown at apex, 1.5–3 μ thick, thicker at apex, 4–12 μ , smooth; pedicel yellow, one half length of spore or less; mesospores 10–50 per cent., ellipsoid, obovoid, or angular, 16–23 by 29–50 μ , the wall 1.5–3 μ , thick, thicker at apex, 4–9 μ .

ON ALLIACEAE:

Allium acuminatum Hook., Idaho, Oregon, Utah, Washington.

Allium attenuifolium Kellogg, California, Oregon.

Allium Brandegei S. Wats., Colorado.

Allium cernuum Roth, Colorado, Wyoming.

Allium precox Brandegee, California.

Allium scaposum Benth., Arizona.

Allium serratum S. Wats., California.

Allium unifolium Kellogg, California.

Allium sp., Nevada; Morelos.

TYPE LOCALITY: France, on *Allium multiflorum*.

DISTRIBUTION: Western North America; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 250; Corda, Ic. Fung. 4: pl. 3, f. 31; Holway, N. Am. Ured. 1: pl. 7, f. 31a–e; Krypt.-fl. Brand. Pilze 3: f. B161.

EXSICCATI: Barth, N. Am. Ured. 18, 1329, 1532; Ellis & Ev. N. Am. Fungi 2989; Garrett, Fungi Utah. 83 (in part).

149. *Dicaeoma Porri* (Sow.) Kuntze, Rev. Gen. 3³: 470. 1898.

Uredo Porri Sow. Engl. Fungi pl. 411. 1810.

Uredo alliorum DC. Fl. Fr. 6: 82. 1815.

Caeoma Scorodizon Schlecht. Fl. Berol. 2: 118. 1824.

Caeoma alliorum Link, in Willd. Sp. Pl. 6²: 7. 1825.

Erysibe limbata alliorum Wallr. Fl. Crypt. Germ. 2: 195. 1833.

Erysibe appendiculata alliorum Wallr. Fl. Crypt. Germ. 2: 210. 1833.

Uredo areolata Rab. Deutschl. Krypt.-Fl. 1: 9. 1844.

Uromyces alliorum Lévy. Ann. Sci. Nat. III. 8: 375. 1847.

Puccinia mixta Fuckel, Symb. Myc. 58. 1869.

Puccinia Porri Wint. in Rab. Krypt.-Fl. 1¹: 200. 1881.

Uromyces durus Dietel, Ann. Myc. 5: 70. 1907.

O. Pycnia amphigenous, scattered among the aecia, depressed, becoming brownish, globoid, 60–90 μ wide by 55–80 μ high; ostiolar filaments rarely protruding.

I. Aecia amphigenous, gregarious on yellow spots, short-cylindric, 0.2–0.4 mm. in diameter; peridium whitish, the margin recurved, lacerate; peridial cells 16–21 by 27–32 μ , overlapping, the outer wall transversely striate, rather thick, 7–9 μ , the inner wall thinner, 3–5 μ , verrucose; aeciospores globoid or angular, 18–20 by 19–26 μ ; wall yellow, 1–2 μ thick, finely verrucose.

II. Uredinia amphigenous, many, scattered, oval or oblong, rather small, 0.2–0.4 by 0.3–0.7 mm., early naked, pulverulent, yellowish, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or globoid, 20–24 by 23–29 μ ; wall yellow, rather thin, 1–2 μ , finely echinulate, the pores 8–10, scattered.

III. Telia amphigenous, many, scattered or sometimes rather confluent, angular or irregular, 0.2–0.5 by 0.3–1 mm., tardily naked, blackish or lead-colored; stroma variable, sometimes weakly developed, sometimes forming a thick golden-brown layer; teliospores ellipsoid, 17–21 by 32–37 μ , rounded or truncate at apex, rounded or narrowed below, constricted at septum; wall chestnut-brown, 1–2 μ thick, sometimes slightly thickened at apex up to 4 μ ; pedicel pale, deciduous; mesospores very numerous, 50–99 + per cent., irregularly obovoid or ellipsoid, 15–20 by 23–33 μ , the wall chestnut-brown, rather thin, 1–2 μ , thickened slightly up to 4 μ above, or not at all, the pedicel pale, fragile.

ON ALLIACEAE:

Allium Ceba L., Connecticut.

Allium Schoenoprasum L., Connecticut, New York.

TYPE LOCALITY: England, on leek [*Allium Porrum*].

DISTRIBUTION: Eastern United States, rare, possibly not established; also in Europe and Asia.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 61; Krypt.-fl. Brand. Pilze 3: f. B160.

150. *Dicaeoma granulisorum* (Ellis & Gall.) Kuntze, Rev. Gen. 3³: 469. 1898.

Puccinia granulisporea Ellis & Gall.; Ellis & Ev. Bull. Torrey Club 22: 61. 1895.

O. Pycnia amphigenous, scattered or crowded in groups 1–3 mm. across, conspicuous, projecting, honey-yellow, flask-shaped or globoid, 96–112 μ wide by 112–125 μ high; ostiolar filaments short, up to 96 μ long.

I. Aecia amphigenous, scattered or gregarious, cylindric, 0.2–0.5 mm. wide; peridium whitish, the margin usually erect, erose or lacerate; peridial cells rhomboidal or rectangular, 17–22 by 23–42 μ , overlapping, the outer wall 7–9 μ thick, transversely striate, the inner wall thinner, 3–5 μ , closely and finely verrucose; aeciospores angularly ellipsoid or globoid, 16–23 by 23–32 μ ; wall colorless, 1.5–2 μ thick, closely and finely verrucose.

II. Uredinia amphigenous, scattered, oval or oblong, 0.3–0.5 mm. wide by 0.5–1.5 mm. long, tardily naked, pulverulent, yellowish- or golden-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, globoid, or obovoid, 23–32 by 28–39 μ ; wall yellow or golden-brown, 1.5–2.5 μ thick, closely and finely echinulate, the pores 8–15, scattered, usually prominent and easily seen in lactic acid.

III. Telia amphigenous or caulicolous, many, scattered, irregularly oblong, linear or confluent into well defined areas, 0.3–0.7 mm. wide by 0.5–1.5 mm. long, or up to 7 mm. long on the stem, rather tardily naked, opening by a longitudinal slit, finally becoming somewhat pulverulent, blackish, ruptured epidermis conspicuous; stroma golden-brown, variable, usually only slightly developed, sometimes strongly developed; teliospores clavate or ellipsoid, 20–32 by 42–70 μ , obtuse or rounded above, obtuse or narrowed below, somewhat constricted at septum; wall cinnamon-brown below, chestnut-brown above, 1–2 μ thick, thicker at apex, 2.5–8 μ , smooth; pedicel usually short, colorless or light-yellow; mesospores 10–60 per cent., ellipsoid or obovoid, 18–25 by 30–50 μ , the wall cinnamon- or chestnut-brown, thin, 1–2 μ , thicker at apex, 2.5–8 μ , the pedicel usually short.

This species agrees in all essentials with *Nigredo bicolor* (Ellis) Arth., except in the possession of some two-celled teliospores. The forms are separately maintained for convenience, but should eventually be united under one name.

ON ALLIACEAE:

Allium cernuum Roth, Idaho, Montana; Alberta.

Allium Nevii S. Wats., Oregon.

Allium recurvatum Rydb., Montana.

Allium stellatum Ker, Montana.

Allium sp., Colorado, Washington; British Columbia.

TYPE LOCALITY: Montana, on stems and leaves of *Allium cernuum*.

DISTRIBUTION: Mountainous regions from Oregon and Idaho northward into Canada.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 7, f. 31a; pl. 8, f. 31b.

151. *Dicaeoma nodosum* (Ellis & Hark.) Kuntze, Rev. Gen. 3³: 469. 1898.

Puccinia nodosa Ellis & Hark. Bull. Calif. Acad. 1:27. 1884.

O. Pycnia amphigenous, honey-yellow, depressed-globoid, 144–200 by 110–144 μ .

I. Aecia amphigenous, on conspicuous yellow spots, in small groups; peridium short,

erect, the margin irregularly lacerate; peridial cells irregularly rectangular, about 13–21 by 32–35 μ , abutted, the outer wall transversely striate, rather thick, 4–9 μ , the inner wall verrucose, thinner, 2–3 μ ; aeciospores globoid or ellipsoid, 21–26 by 26–31 μ ; wall golden-yellow, 1.5–2 μ thick, finely and closely verrucose.

II. Uredinia amphigenous, many, scattered, oval or oblong, 0.3–0.6 by 0.4–1.5 mm., rather early naked by a somewhat irregular longitudinal slit, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or ellipsoid, 23–32 by 30–39 μ ; wall light golden-brown, moderately thick, 1.5–2.5 μ , finely echinulate with blunt points, the pores 10–14, scattered.

III. Telia amphigenous, many, scattered, linear-oblong, 0.3–0.6 by 0.4–1.5 mm., rather early naked by a longitudinal slit, pulverulent, blackish, ruptured epidermis conspicuous; teliospores oblong, 25–33 by 42–63 μ , rounded or truncate above, rounded or narrowed below, slightly or not constricted at septum; wall uniformly thick, 3–4 μ , dark chocolate-brown, very coarsely tuberculate; pedicel pale or colorless, deciduous.

ON ALLIACEAE:

Dipterostemon capitata (Benth.) Rydb. (*Brodiaea capitata* Benth.), California.

TYPE LOCALITY: Antioch, California, on *Brodiaea capitata*.

DISTRIBUTION: The coast of California from San Francisco southward.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 8, f. 32a, b.

EXSICCATI: Ellis & Ev. Fungi Columb. 1188; Ellis & Ev. N. Am. Fungi 3572.

152. *Dicaeoma Asparagi* (DC.) Kuntze, Rev. Gen. 3³: 467. 1898.

Puccinia Asparagi DC. Fl. Fr. 2: 595. 1805.

Puccinia Discoidearum Asparagi Wallr. Fl. Crypt. Germ. 2: 222. 1833.

Aecidium Asparagi Lasch; Klotzsch, Herb. Viv. Myc. 1179. 1847; Flora 31: 509. 1848.

Uredo Asparagi Lasch; Klotzsch, Herb. Viv. Myc. 1180. 1847; Flora 31: 509. 1848.

Puccinia oxypus Bon. Abh. Nat. Ges. Halle 5: 219. 1860.

O. Pycnia caulicolous, loosely gregarious among the aecia, punctiform, honey-yellow becoming brownish, globoid or flattened-globoid, 80–130 μ wide by 90–150 μ deep; ostiolar filaments short, 30–40 μ .

I. Aecia caulicolous, scattered or often gregarious on oblong or lenticular spots, short-cylindric, 0.2–0.3 mm. wide by 0.2–0.4 mm. high; peridium white, the margin erect, incised; peridial cells rhomboidal, 12–23 by 20–35 μ , the outer wall thick, 5–10 μ , transversely striate, the inner wall thin, 2–4 μ , coarsely granular; aeciospores globoid or angular, 15–21 by 17–26 μ ; wall pale-yellow, thin, 1 μ , finely verrucose.

II. Uredinia caulicolous, many, scattered, oblong or linear, 0.2–0.5 by 0.3–3 mm., rather early naked by a longitudinal slit, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or ellipsoid, 18–25 by 22–30 μ ; wall golden-yellow, moderately thick, 1.5–2 μ , closely and minutely echinulate, the pores usually 4, equatorial.

III. Telia caulicolous, many, scattered or more or less confluent on lenticular areas, individual sori oblong or linear, 0.2–1 by 0.4–3 mm., rather early naked, somewhat pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 18–25 by 30–48 μ , rounded at both ends, slightly constricted at septum; wall chestnut-brown, moderately thick, 2–3 μ , thickened above, 4–8 μ , smooth; pedicel somewhat colored, one-half to twice length of spore; mesospores often quite numerous, ellipsoid or angular, 19–23 by 29–35 μ , the wall chestnut-brown, moderately thick, 2–3 μ , thicker at apex, 4–9 μ , smooth, the pedicel often twice length of spore.

ON ALLIACEAE:

Allium Cepa L., Iowa, Nebraska.

ON CONVALLARIACEAE:

Asparagus officinalis L., California, Colorado, Connecticut, Delaware, Indiana, Iowa, Kansas, Kentucky, Massachusetts, Michigan, Missouri, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, South Dakota, Texas, West Virginia, Wisconsin; Manitoba, Ontario.

TYPE LOCALITY: France, on *Asparagus officinalis*.

DISTRIBUTION: Introduced with asparagus culture throughout North America; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2: f. 185; Holway, N. Am. Ured. 1: pl. 9, f. 37; Krypt.-fl. Brand. Pilze 3: f. B89; Rostr. Plantep. Haandb. f. 82.

EXSICCATI: Barth. Fungi Columb. 3931, 4255, 4659, 4841; Barth. N. Am. Ured. 329, 818, 1427, 1526, 1527, 2225; Brenckle, Fungi Dak. 261; Ellis & Ev. Fungi Columb. 1184, 1568; Ellis & Ev. N. Am. Fungi 3574; Kellerm. Ohio Fungi 27; Seym. & Earle, Econ. Fungi 500.

153. *Dicaeoma Smilacis* (Schw.) Kuntze, Rev. Gen. 3³: 470. 1898.*Aecidium Smilacis* Schw. Schr. Nat. Ges. Leipzig 1: 69. 1822.*Uredo Smilacis* Schw. Schr. Nat. Ges. Leipzig 1: 70. 1822.*Puccinia Smilacis* Schw. Schr. Nat. Ges. Leipzig 1: 72. 1822.*Caeoma Smilacis* Link, in Willd. Sp. Pl. 6²: 9. 1825.*Caeoma smilacinatum* Link, in Willd. Sp. Pl. 6²: 43. 1825.*Aecidium* (*Caeoma*) *smilacinatum* Schw. Trans. Am. Phil. Soc. II. 4: 309. 1832.

O. Pycnia epiphyllous, few, gregarious on dark-brown spots opposite the aecia, inconspicuous, becoming dark-brown, punctiform, about 0.1 mm. in diameter.

I. Aecia hypophyllous, gregarious on considerably raised, circular, dark-brown spots 2–10 mm. in diameter, immersed, cupulate, 0.2–0.3 mm. in diameter; peridium whitish, the margin erect, lacerate; peridial cells rhomboidal, 16–23 by 26–40 μ , much overlapping, the outer wall thick, 7–15 μ , smooth, transversely striate, the inner wall thin, 2–5 μ , verrucose; aeciospores globoid or broadly ellipsoid, 19–25 by 23–29 μ ; wall colorless, thin, 1–2 μ , verrucose.

II. Uredinia hypophyllous, numerous, scattered or sometimes confluent, roundish, oval or irregular, 0.2–1 by 0.2–1.5 mm., early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid, 17–24 by 23–32 μ ; wall yellowish or golden, moderately thick, 1.5–2.5 μ , moderately echinulate, the pores 3, occasionally 2 or 4, equatorial.

III. Telia hypophyllous, numerous, scattered or confluent in rings, often concentrically arranged, roundish, oval or irregular, 0.2–0.5 by 0.2–1.5 mm., early naked, compact, pulvinate, blackish, ruptured epidermis conspicuous; teliospores ellipsoid, 17–23 by 30–51 μ , rounded or acute above, usually narrowed below, constricted at septum; wall cinnamon-brown, moderately thin, 1–2.5 μ , thicker at apex, 5–10 μ , smooth, often with a subhyaline umbo over the apical pore; pedicel hyaline, usually fragile.

ON SMILACACEAE:

Nemexia herbacea (L.) Small (*Smilax herbacea* L.), District of Columbia, Kentucky.*Nemexia tamnifolia* (Michx.) Small (*Smilax tamnifolia* Michx.), Texas.*Smilax Bona-nox* L., Arkansas, Florida, Louisiana, Oklahoma, South Carolina, Tennessee, Texas.*Smilax domingensis* Willd., Porto Rico.*Smilax glauca* Walt., Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Indiana, Kentucky, Mississippi, New Jersey, New York, North Carolina, Ohio, South Carolina, Tennessee, Texas, Virginia.*Smilax havanensis* Jacq., Cuba.*Smilax hispida* Muhl., District of Columbia, Nebraska.*Smilax laurifolia* L., New Jersey.*Smilax Pseudo-china* L., South Carolina, Texas.*Smilax rotundifolia* L., Arkansas, Delaware, District of Columbia, Louisiana, Maryland, North Carolina, Oklahoma, Tennessee, Virginia.*Smilax* sp., Oaxaca; Jamaica.TYPE LOCALITY: [Salem,] North Carolina, on *Smilax rotundifolia*.

DISTRIBUTION: Southern New York, Ohio, and Nebraska southward through the West Indies and Mexico.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 10, f. 40.

EXSICCATI: Barth. Fungi Columb. 2468, 2864, 2865, 4574, 5072; Barth. N. Am. Ured. 968, 1076, 1173, 1370, 1571, 1667, 1866, 1867, 2057, 2058, 2163, 2264; Ellis & Ev. Fungi Columb. 1660, 1661; Ellis, N. Am. Fungi 1062, 1477; Kellerm. Ohio Fungi 14; Seym. & Earle, Econ. Fungi 218, 390, 391; Sydow, Ured. 2331; Thüm. Myc. Univ. 30, 1643.

154. *Dicaeoma* (?) *Aletridis* (Berk. & Curt.) Kuntze, Rev. Gen. 3³: 467. 1898.*Puccinia Aletridis* Berk. & Curt. Grevillea 3: 52. 1874.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered, roundish or elliptic, small, 0.1–0.3 mm. across, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or ellipsoid, 15–22 by 20–28 μ ; wall cinnamon-brown, rather thin, 1.5 μ , moderately or sparsely and strongly echinulate, the pores 2, superequatorial.

III. Telia amphigenous, scattered, roundish or elliptic, small, 0.2–0.4 mm. across, rather tardily naked, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores oblong or clavate-oblong, 14–20 by 30–50 μ , obtuse or acute above, obtuse or narrowed below, slightly constricted at septum; wall smooth, light golden-brown, rather thin, 1–1.5 μ , much thicker, 3–10 μ , and paler at apex; pedicel nearly colorless, slender, one half to once length of spore.

ON AMARYLLIDACEAE:

Aletris aurea Walt., Florida, Mississippi, South Carolina, Texas.*Aletris farinosa* L., Delaware, Massachusetts, New Jersey, Rhode Island.*Aletris lutea* Small, Florida.TYPE LOCALITY: South Carolina, on *Aletris aurea*.

DISTRIBUTION: The states bordering the Atlantic Ocean and Gulf of Mexico from Massachusetts to Texas.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 9, f. 39.

EXSICCATI: Ellis, N. Am. Fungi 1454; Rab.-Wint. Fungi Eur. 3119; Roum. Fungi Sel. 4825; Thüm. Myc. Univ. 2230.

155. *Dicaeoma Cooperiae* (Long) Arth. Résult. Sci. Congr. Bot.
Vienne 344, 1906.

Puccinia Cooperiae Long, Bull. Torrey Club 29: 110. 1902.O. Pycnia amphigenous, in open elliptic groups, pale-yellow becoming brownish, flattened-globoid, 130–160 μ broad by 110–150 μ high; ostiolar filaments about 30 μ long.I. Aecia amphigenous, numerous, gregarious in oblong groups, cupulate, half immersed, about 0.3 mm. in diameter; peridium whitish, the margin erect, lacinate; peridial cells rhomboidal, 13–22 by 20–32 μ , the outer wall rather thick, 6–12 μ , transversely striate, the inner wall thinner, 3–6 μ , coarsely verrucose; aeciospores globoid or ellipsoid, 17–22 by 20–28 μ ; wall pale-yellow or colorless, thin, 1–1.5 μ , inconspicuously verrucose.II. Uredinia amphigenous, numerous, scattered, oval or oblong, 0.2–0.7 by 0.4–1 mm., rather early naked by longitudinal slits, pulverulent, cinnamon-brown, ruptured epidermis membranous, conspicuous; urediniospores ellipsoid or obovoid, 17–25 by 22–32 μ ; wall hyaline or light-yellow, thin, 1–2 μ , finely echinulate, the pores inconspicuous, 3 or 4, equatorial or nearly so.III. Telia amphigenous, numerous, scattered, ellipsoid or irregular, 0.3–1 by 0.5–2 mm., rather early naked by longitudinal slits, pulverulent, grayish- or chestnut-brown, ruptured epidermis membranous, conspicuous; teliospores ellipsoid, clavate or irregular, angular, 19–28 by 32–48 μ , rounded or truncate above, rounded or narrowed below, the septum often oblique, slightly constricted; wall cinnamon-brown, uniformly thin, 1.5–2 μ , smooth except for 2–5 longitudinal lines formed by the angles; pedicel nearly colorless, fragile, often inserted laterally; mesospores very few.

ON AMARYLLIDACEAE:

Cooperia Drummondii Herb., Texas.*Cooperia pedunculata* Herb., Texas.TYPE LOCALITY: Austin, Texas, on *Cooperia Drummondii*.

DISTRIBUTION: Central Texas.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 10, f. 41.

EXSICCATI: Barth. N. Am. Ured. 135; Ellis & Ev. Fungi Columb. 1644.

156. *Dicaeoma* (?) *Bomareae* (Lagerh.) Arthur.

Uredo Bomareae Lagerh.; Pat. & Lagerh. Bull. Soc. Myc. Fr. 11: 215. 1895.*Puccinia Bomareae* P. Henn. Hedwigia 35: 242. 1896.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, few, scattered, soon surrounded by the telia, circular or oblong, 0.2–1 mm. long, somewhat tardily naked, pulverulent, golden-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or globoid, 18–26 by 23–29 μ ; wall light-yellow or lemon-yellow, 1–2 μ thick, finely and closely or moderately echinulate, the pores obscure.III. Telia hypophyllous, numerous, compound in patches 1–3 mm. long or circinating about the uredinia, individual sori minute, 0.5–1 mm. across, long covered by the epidermis, somewhat pulvinate, chestnut-brown; stroma present, surrounding the sorus, thin, chestnut-brown; teliospores irregularly ellipsoid or clavate, 15–25 by 33–55 μ , variously rounded, truncate or narrowed at both ends, slightly constricted at septum; wall lemon-yellow, about 1.5–2 μ thick, thicker above, 3–9 μ , smooth; pedicel cinnamon- or chestnut-brown, short, up to one third length of spore.

ON AMARYLLIDACEAE:

Bomarea acutifolia Benth., Morelos, Oaxaca, Veracruz; Guatemala.*Bomarea ovata* Mirb., Oaxaca.

TYPE LOCALITY: Quito, Ecuador, on leaves of *Bomarea* sp.
 DISTRIBUTION: Southern Mexico and Central America; also in South America.
 ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 10, f. 42.
 EXSICCATI: Barth. Fungi Columb. 4563; Barth. N. Am. Ured. 822.

157. *Dicaeoma Pallor* (Arth. & Holway) Arthur.

Puccinia Pallor Arth. & Holway; Arth. Mycologia 10: 129. 1918.

O. Pycnia amphigenous, crowded in small groups, 0.6–1 mm. across, noticeable, yellowish- or chestnut-brown, globose, 96–160 μ in diameter; ostiolar filaments often agglutinated into a column, 112–160 μ long.

I. Aecia amphigenous, circinating about the pycnia, rather inconspicuous, 0.2–0.4 mm. in diameter, overarched by two or more layers of cells of the host tissue opening rather tardily by a slit or pore; peridium lacking, the aecia sometimes bordered at the sides by a thin layer of mycelium; aeciospores globose or broadly ellipsoid, 18–23 by 19–24 μ ; wall colorless, thin, 1–1.5 μ , closely and finely verrucose.

II. Uredinia hypophyllous, scattered, oval or oblong, 0.4–1 mm. long, rather tardily naked, at first opening by a slit or pore, later uncovered, pulverulent, yellowish, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 18–21 by 23–28 μ ; wall colorless, thin, 1–1.5 μ , finely and closely echinulate, the pores obscure.

III. Telia hypophyllous, scattered, oval or oblong, 0.3–0.8 mm. long, rather early naked, somewhat pulverulent, white, ruptured epidermis evident; teliospores oblong or fusiform-oblong, 16–23 by 42–64 μ , rounded or acute above, rounded or narrowed below, constricted at septum, germinating at maturity; wall colorless, thin, 1 μ , sometimes thickened on the sides or apex up to 3–4 μ , smooth; pedicel colorless, somewhat fragile, up to 35 μ long.

ON AMARYLLIDACEAE:

Bomarea acutifolia Herb., Guatemala.

Bomarea sp., Costa Rica.

TYPE LOCALITY: Volcán de Agua, Antigua, Guatemala, on *Bomarea acutifolia*.

DISTRIBUTION: Guatemala and Costa Rica.

158. *Dicaeoma* (?) *Iridis* (DC.) Kuntze, Rev. Gen. 3³: 469. 1898.

Uredo Iridis DC.; Poir. in Lam. Encyc. 8: 224. 1808.

Caeoma (*Uredo*) *Iridis* Schw. Trans. Am. Phil. Soc. II. 4: 290. 1832.

Puccinia clavuligerae Iridis Wallr. Fl. Crypt. Germ. 2: 223. 1833.

Uredo limbata f. *Iridis* Rab. Deutschl. Krypt.-Fl. 1: 12. 1844.

Puccinia Iridis Rab. Deutschl. Krypt.-Fl. 1: 23. 1844.

Uromyces Iridis Lévl. Ann. Sci. Nat. III. 8: 371. 1847.

Puccinia truncata Berk. & Br. Ann. Mag. Nat. Hist. II. 13: 461. 1854.

Trichobasis iridicola Peck, Rep. N. Y. State Mus. 24: 89. 1872.

Puccinia crassivertex Thüm. Myc. Univ. 546. 1876.

Trichobasis Iridis Cooke, Micr. Fungi ed. 4. 227. 1878.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, numerous, scattered, roundish, oval or oblong, 0.2–0.5 by 0.4–1 mm., early naked by longitudinal slits of the epidermis, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or globose, 19–27 by 24–32 μ ; wall yellow or light cinnamon-brown, thick, 2–3.5 μ , rather closely echinulate, the pores 3–4, equatorial or sometimes scattered.

III. Telia amphigenous, numerous, scattered or sometimes confluent, oblong or linear, 0.2–0.6 by 0.5–2 mm., early naked, compact, becoming pulverulent, ruptured epidermis noticeable; teliospores ellipsoid, clavate or oblong, 13–22 by 34–55 μ , rounded or truncate above, narrowed below, somewhat constricted at septum, sometimes 3-celled; wall light- or golden-brown, rather thin, 1.5–2.5 μ , thickened at apex, 5–10 μ , smooth; pedicel concolorous, as long as spore or less.

ON IRIDACEAE:

Iris Douglasiana Herb., California.

Iris fulva Ker (*I. cuprea* Pursh), Louisiana.

Iris longipetala Herb., California.

Iris missouriensis Nutt., Arizona, California, Colorado, Idaho, Washington.

Iris tenax Dougl., Oregon.

Iris tuberosa L., California.

Iris versicolor L., Connecticut, Delaware, Indiana, Iowa, Louisiana, Maine, Massachusetts, Michigan, New York, Pennsylvania, Vermont, Wisconsin; Nova Scotia, Ontario, Quebec.

Iris Xiphium L., California.

TYPE LOCALITY: France, on *Iris pumila*.

DISTRIBUTION: Nearly throughout the United States and Canada, only uredinia occurring east of the Rocky Mountains; also in Europe, Asia, and Japan.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl.* 10, *f.* 43; Krypt.-fl. Brand. Pilze 3: *f.* B88.

EXSICCATI: Barth. Fungi Columb. 3457, 3663, 4151; Barth. N. Am. Ured. 43, 348, 1160, 1255; Ellis & Ev. Fungi Columb. 988, 1856; Ellis, N. Am. Fungi 249; Sydow, Ured. 1719; Thüm. Myc. Univ. 2042.

159. *Dicaeoma* (?) *angulatum* (Dietel & Neger) Arthur.

Puccinia angulata Dietel & Neger, Bot. Jahrb. 24: 156. 1897.

O. Pycnia not seen.

I. Aecia scattered, solitary on small yellowish spots; peridium white, lacerate, reflexed; aeciospores angularly oblong, 15–20 by 21–28 μ ; wall minutely verrucose.

II. Uredinia amphigenous, scattered, oblong or linear, 0.6–1.5 mm. long, early naked, pulverulent, yellowish, ruptured epidermis conspicuous; urediniospores broadly ellipsoid, 18–23 by 23–27 μ ; wall colorless or slightly yellowish, 1–1.5 μ thick, closely and finely echinulate, the pores 8–9, scattered.

III. Telia amphigenous, scattered, oval or oblong, 0.1–0.7 mm. long, long covered by the epidermis, compact, ruptured epidermis evident; stroma well developed, golden-brown, dividing the spores into groups; teliospores angular-clavate or ellipsoid, 18–26 by 35–55 μ , rounded or obtuse above, narrowed toward the base, not or slightly constricted at septum; wall cinnamon- or chestnut-brown in upper part, thin, 1–1.5 μ , 2–7 μ at apex, smooth; pedicel yellowish, fragile; mesospores 20–40 per cent., ellipsoid or obovoid, 16–23 by 29–47 μ .

ON IRIDACEAE:

Sisyrinchium sp., Mexico (state).

TYPE LOCALITY: Vicinity of Santiago, Chile, on *Sisyrinchium pedunculatum*.

DISTRIBUTION: Southern Mexico; also in South America.

160. *Dicaeoma* (?) *Cannae* (Wint.) Arthur.

Uredo Cannae Wint. Hedwigia 23: 172. 1884.

Puccinia Thaliae Dietel, Hedwigia 38: 250. 1899.

Puccinia Cannae P. Henn. Hedwigia 41: 105. 1902.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, few to many, scattered, rounded or oblong, 0.3–0.5 mm. wide by 0.3–1 mm. long, located under the second layer of surface cells, sometimes with weakly developed stroma, tardily naked, pulverulent, pale-golden, ruptured epidermis evident; urediniospores ellipsoid or obovoid, often angular and irregular, 18–24 by 27–43 μ ; wall nearly hyaline, 1–2 μ thick, moderately or rather sparsely echinulate, the pores usually obscure, sometimes showing as 2, approximately equatorial.

III. Telia chiefly hypophyllous, few to many, scattered or sometimes surrounding the uredinia, irregularly circular or oblong, small, 0.2–0.5 mm. across, situated below the second layer of host-cells, tardily naked, blackish, overlying epidermis transparent and inconspicuous; teliospores oblong-clavate or cylindric, rounded or truncate above, not or only slightly constricted at septum, 13–23 μ wide by 39–78 μ long; wall cinnamon-brown, often appearing paler below, 1 μ thick, thickened at apex, 2–7 μ , smooth; pedicel short, light cinnamon-brown, up to 20 μ long.

ON MARANTACEAE:

Calathea lutea (Aubl.) G. Meyer, Cuba; Porto Rico.

Thalia geniculata L., Porto Rico.

ON CANNACEAE:

Canna coccinea Ait. (*C. portoricensis* Bouché), Porto Rico.

Canna glauca L., Porto Rico.

Canna indica L., Guatemala; Cuba.

Canna sp., British Honduras; Panama; Jamaica; St. Domingo.

TYPE LOCALITY: San Francisco, Santa Catharina, Brazil, on *Canna* sp.

DISTRIBUTION: West Indies and Central America; also in South America.

ILLUSTRATIONS: Sydow, Monog. Ured. 1: *pl.* 33, *f.* 455.

EXSICCATI: Barth. Fungi Columb. 2387; Barth. N. Am. Ured. 1638; Kellerm. Fungi Sel. Guat. 3; Sydow, Ured. 2114.

161. *Dicaeoma* (?) *Cypripedii* (Arth. & Holway) Arthur.

Puccinia Cypripedii Arth. & Holway; Arth. Bull. Iowa Agr. Coll. Dep. Bot. 1884: 156. 1884.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, oval, 0.2–1 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores obovoid or ellipsoid, 15–19 by 18–23 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 2, super-equatorial.

III. Telia amphigenous, somewhat crowded in groups, circular or oval, 0.4–1 mm. long, early naked, compact, pulvinate, chocolate-brown, ruptured epidermis noticeable; teliospores ellipsoid or clavate, 14–23 by 31–45 μ , rounded or flattened above, narrowed below, somewhat constricted at septum; wall cinnamon-brown, 1.5 μ thick, light chestnut-brown at apex and thicker, 7–12 μ , smooth; pedicel slightly tinted or golden-brown, about one half length of spore.

ON ORCHIDACEAE:

Cypripedium parviflorum Salisb. (*C. pubescens* Willd.), Iowa.

Limodorum tuberosum L. (*Calopogon pulchellus* R. Br.), Indiana, New Jersey.

TYPE LOCALITY: Decorah, Iowa, on *Cypripedium pubescens*.

DISTRIBUTION: Local in New Jersey, Indiana and Iowa.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 10, f. 44a, b.

EXSICCATI: Barth. N. Am. Ured. 33; Ellis, N. Am. Fungi 1473.

162. *Dicaeoma* *Polygoni-amphibii* (Pers.) Arth. Proc. Ind.

Acad. Sci. 1898: 184. 1899.

Puccinia Polygoni-amphibii Pers. Syn. Fung. 227. 1801.

Uredo Polygoni Schum. Enum. Pl. Saell. 2: 233. 1803.

Uromyces Betae Convolvuli Alb. & Schw. Consp. Fung. 127. 1805.

Puccinia Polygoni Alb. & Schw. Consp. Fung. 132. 1805. Not *P. Polygoni* Pers. 1794.

Puccinia Polygoni-Convolvuli Hedw. f.; Poir. in Lam. Encyc. 8: 251. 1808.

Uredo Polygoni Persicariae Strauss, Ann. Wett. Ges. 2: 104. 1810.

Caeoma (*Dicaeoma*) *Polygoni* Mart. Fl. Crypt. Erlang. 321. 1817.

Dicaeoma Persicariae S. F. Gray, Nat. Arr. Brit. Pl. 1: 541. 1821.

Aecidium Geranii-maculati Schw. Schr. Nat. Ges. Leipzig 1: 67. 1822.

Puccinia Polygoni-Pennsylvanici Schw. Schr. Nat. Ges. Leipzig 1: 72. 1822.

Puccinia concentrica Schw. Trans. Am. Phil. Soc. II. 4: 295. 1832.

Puccinia Amphibii Fuckel, Jahrb. Nass. Ver. Nat. 27–28: 15. 1873.

Dicaeoma Polygoni-Convolvuli Arth. Proc. Ind. Acad. Sci. 1898: 184. 1899.

Aecidium sanguinolentum Lindr. Bot. Not. 1900: 241. 1900.

O. Pycnia amphigenous, gregarious in groups 1–8 mm. in diameter, conspicuous, honey-yellow, becoming brown, flattened-globoid, 115–160 μ wide by 80–100 μ high; ostiolar filaments 110–144 μ long, usually agglutinated into a column.

I. Aecia hypophyllous, closely crowded on yellowish or reddish spots 3–10 mm. in diameter, cupulate, 0.2–0.4 mm. in diameter; peridium slightly yellowish-brown, recurved, lacerate; peridial cells rhombic, 14–23 by 21–35 μ , slightly overlapping, the outer wall 5–10 μ thick, transversely striate, the inner wall 2–5 μ thick, closely and prominently verrucose; aeciospores globoid or broadly ellipsoid, 13–18 by 16–22 μ ; wall colorless, thin, 0.5–1 μ , very finely and closely verrucose.

ON GERANIACEAE:

Geranium columbinum L., Connecticut.

Geranium incisum Nutt., Montana.

Geranium maculatum L., Connecticut, District of Columbia, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, North Carolina, Pennsylvania, Virginia, West Virginia, Wisconsin; Ontario.

II. Uredinia amphigenous, numerous, scattered, or crowded in small groups, round or oblong, 0.1–0.7 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 15–22 by 19–29 μ ; wall cinnamon- or golden-brown, 1–1.5 μ thick, closely or moderately echinulate, the pores 2, occasionally 3, super-equatorial or on *Tovara* subequatorial.

III. Telia amphigenous or caulicolous, scattered, often becoming confluent, in small groups, round, 0.1–1.3 mm. in diameter, or linear up to 2.5 mm. long on stems, long covered by the epidermis, (or early naked on *Bilderdykia* and *Gonopyrum*), compact, dark grayish-brown (or brownish-black and shining on *Bilderdykia* and *Gonopyrum*), ruptured epidermis noticeable; teliospores ellipsoid or clavate, 14–23 by 30–55 μ , rounded or truncate above, narrowed

below, slightly constricted at septum; wall cinnamon-brown below, chestnut-brown above, rather thin, 1–2 μ , thickened at apex, 5–10 μ , smooth; pedicel pale-yellow or colorless, about half length of spore.

This species is composed of quite distinct races, partly made evident by cultures and partly indicated by slight morphological characters. The form on *Persicaria* with long covered telia has aecia on one group of Geraniums while the form on *Bilderdykia* (and *Gonopyrum*?) has aecia on another group of Geraniums. The form on *Tovara virginiana* is distinguished by the sub-equatorial pores of the urediniospores, the aecial relations not being known.

ON POLYGONACEAE:

Bilderdykia Convolvulus (L.) Dumort. (*Polygonum Convolvulus* L., *Tiniaria Convolvulus* Webb & Moq.), Delaware, Illinois, Indiana, Iowa, Kansas, Maryland, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York, Ohio, Pennsylvania, South Dakota, West Virginia, Wisconsin; Ontario.

Bilderdykia cristata (Engelm. & Gray) Greene (*Polygonum cristatum* Engelm. & Gray, *Tiniaria cristata* Small), Mississippi, North Carolina, Pennsylvania, Texas, Virginia.

Bilderdykia scandens (L.) Greene (*Polygonum scandens* L., *Tiniaria scandens* Small), Indiana, Kentucky, Nebraska, New York, Virginia, West Virginia, Wisconsin.

Gonopyrum articulatum (L.) Fisch. & Mey. (*Polygonella articulata* Meissn.), Florida.

Persicaria coccinea (Muhl.) Greene (*Polygonum amphibium* Hook. not L.), Maine, Utah, Wisconsin; Ontario.

Persicaria Hartwrightii (A. Gray) Greene (*Polygonum Hartwrightii* A. Gray), California, Colorado, Connecticut, Idaho, Illinois, Iowa, Michigan, Minnesota, Montana, Nebraska, New York, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Utah, Vermont, Washington, Wisconsin, Wyoming; Alberta, British Columbia; Manitoba, Nova Scotia.

Persicaria hirsuta (Walt.) Small (*Polygonum hirsutum* Walt.), Florida.

Persicaria hydropiper (L.) Opiz (*Polygonum hydropiper* L.), South Carolina.

Persicaria hydropiperoides (Michx.) Small (*Polygonum hydropiperoides* Michx.), California, Florida, Illinois, Indiana, Mississippi, New York, West Virginia; Ontario.

Persicaria incarnata (Ell.) Small (*Polygonum incarnatum* Ell.), California, New York.

Persicaria lapathifolia (L.) S. F. Gray (*Polygonum lapathifolia* L.), Arkansas, Indiana; Ontario.

Persicaria Muhlenbergii (Meissn.) Small (*Polygonum Muhlenbergii* S. Wats., *P. emersum* Britton), California, Colorado, Idaho, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, Nebraska, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Dakota, Vermont, Washington, Wisconsin, Wyoming; Mexico (state); Ontario, Quebec.

Persicaria pennsylvanica (L.) Small (*Polygonum pennsylvanicum* L.), Alabama, Arkansas, Delaware, Florida, Illinois, Indiana, Kentucky, Louisiana, Mississippi, New York, South Carolina, Tennessee, Texas; Quebec.

Persicaria Persicaria (L.) Small (*Polygonum Persicaria* L.), Louisiana, Oregon, Pennsylvania.

Persicaria portoricensis (Bertero) Small (*Polygonum portoricensis* Bertero), Texas; Porto Rico.

Persicaria punctata (Ell.) Small (*Polygonum punctatum* Ell., *P. acre* H.B.K.), Alabama, Arkansas, California, Florida, Illinois, Indiana, Kansas, Kentucky, Michigan, Missouri, New York, Ohio, South Carolina, Texas, West Virginia; Mexico (state); Costa Rica; Guatemala; Cuba; Haiti; Bermuda; Porto Rico.

Persicaria selacea (Baldw.) Small (*Polygonum selaceum* Baldw.), Louisiana, Missouri.

Tovara virginiana (L.) Raf. (*Polygonum virginianum* L.), Connecticut, Illinois, Louisiana, Massachusetts, Missouri, New York, North Carolina, Ohio, West Virginia.

TYPE LOCALITY: Europe, on *Polygonum amphibium* var. *terrestre*.

DISTRIBUTION: Throughout North America; also in South America, Europe, Africa, India, China, and Japan.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 13, f. 55b; Beitr. Krypt. Schweiz 2: f. 220, 221; Krypt.-fl. Brand. Pilze 3: f. B132, 133; Grove, Brit. Rust Fungi f. 175, 176; Corda, Ic. Fung. 2: pl. 8, f. 20; 4: pl. 4, f. 41, pl. 5, f. 62.

EXSICCATI: Barth. Fungi Columb. 2268, 2395, 2463, 2672, 2774, 2799, 2861, 2862, 2863, 2965, 2966, 3176, 3261, 3366, 3567, 3568, 3569, 3570, 3766, 3767, 3961, 3962, 4159, 4368, 4572, 4593, 4762, 4861, 4994; Barth. N. Am. Ured. 165, 361, 464, 465, 564, 656, 657, 762, 861, 960, 961, 992, 1069, 1070, 1167, 1266, 1363, 1364, 1467, 1565, 1566, 1665, 1698, 1772, 1860, 1861, 1963, 2054, 2055, 2158, 2159, 2259. 2260; Brenckle, Fungi Dak. 41; Clements, Crypt. Form. Colo. 574; Ellis, N. Am. Fungi 221, 259, 1455; Ellis & Ev. Fungi Columb. 491, 751, 762, 1863, 2157; Kellerm. Ohio Fungi 92, 93, 115, 175; Rab.-Paz. Fungi Eur. 4130a, b; Rav. Fungi Am. 43, 274; Rav. Fungi Car. 4: 98; Seym. & Earle, Econ. Fungi 371, 373, 374; Sydow, Ured. 1732, 2532.

163. *Dicaeoma Polygoni-vivipari* (H. Dietr.) Arthur.

Puccinia Polygoni-vivipari H. Dietr.; P. Karst. Not. Sällsk. Faun. Fl. Fenn. 8: 221. 1869.

Puccinia uniformis Pammel & Hume; Hume, Proc. Davenport Acad. 7: 250. 1899.

O. Pycnia not seen.

I. Aecia hypophyllous and caulicolous, in small circular or irregular groups 1–4 mm. in diameter, often following the veins, on pale somewhat thickened spots, hemispheric, rather large, about 0.1 mm. in diameter, surrounded by persistent host-tissue, opening at last by a

central pore; peridium fragile, soon disappearing; peridial cells oblong, often collapsed, only slightly differentiated from the spores, 13–19 by 30–34 μ , abutted, the outer wall 3–4 μ thick, smooth or nearly so, transversely striate, the inner wall slightly thinner, 2–3 μ , finely and closely verrucose; aeciospores ellipsoid, 16–24 by 23–28 μ ; wall colorless, moderately thick, 2–3 μ , finely and closely verrucose.

ON AMMIACEAE:

Ligusticum apiifolium (Nutt.) A. Gray, Washington.

II. Uredinia hypophyllous, scattered or in groups, round, about 0.5 mm. in diameter, soon naked, golden-brown, pulverulent, ruptured epidermis evident; urediniospores globoid or ellipsoid, 18–23 by 22–26 μ ; wall pale-yellow or golden, moderately thick, 1.5–2.5 μ , finely and moderately echinulate, the pores about 6, scattered or seemingly in two extra-equatorial zones.

III. Telia hypophyllous, numerous, scattered, round, 0.5–1 mm. in diameter, pulverulent, dark chestnut-brown, ruptured epidermis evident; teliospores broadly ellipsoid or oblong, 15–19 by 20–28 μ , rounded at both ends, slightly or not constricted at septum; wall cinnamon- or chestnut-brown, thin, 1–1.5 μ , not thickened at apex, finely verrucose in a few longitudinal lines, the pores often seen, apical in the upper cell, variously located in the lower; pedicel colorless, fragile, short.

ON POLYGONACEAE:

Bistorta bistortoides (Pursh) Small (*Polygonum bistortoides* Pursh), California, Colorado, New Mexico, Oregon, Washington, Wyoming.

Bistorta vivipara (L.) S. F. Gray (*Polygonum viviparum* L.), Alaska, Colorado, New Hampshire, Wyoming; Alberta, Ontario.

TYPE LOCALITY: Lapland, on *Polygonum viviparum*.

DISTRIBUTION: Alpine stations in the Rocky Mountains from Southern California and New Mexico northward to Alberta, and from the White Mountains in New Hampshire northward to the Arctic Circle; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 76; Holway, N. Am. Ured. 1: pl. 12, f. 53c.

EXSICCATI: Barth. Fungi Columb. 2349; Barth. N. Am. Ured. 126.

164. *Dicaeoma Bistortae* (DC.) Kuntze, Rev. Gen.

3³: 468. 1898.

Uredo Polygoni Bistortae Strauss, Ann. Wett. Ges. 2: 103. 1810.

Puccinia Bistortae DC. Fl. Fr. 6: 61. 1815.

Puccinia Cari-Bistortae Kleb. Zeits. Pflanzenkr. 8: 27. 1898.

Puccinia Angelicae-Bistortae Kleb. Zeits. Pflanzenkr. 12: 142. 1902.

Puccinia Conopodii-Bistortae Kleb. Wirtsw. Rostp. 318. 1903.

Puccinia Astrantiae-vivipari Semad. Centr. Bakt. II. Abth. 46: 452. 1916.

Puccinia Pimpinellae-Bistortae Semad. Centr. Bakt. II. Abth. 46: 454. 1916.

O. Pycnia amphigenous, crowded in small groups 1–2 mm. in diameter, noticeable, honey-yellow becoming light-brown, globoid or flattened-globoid, 128–160 μ wide by 112–128 μ high; ostiolar filaments up to 50 μ long, usually not projecting much beyond the ostiole.

I. Aecia hypophyllous, crowded in groups 3–4 mm. in diameter, hemispheric, 0.3–0.7 mm. in diameter, covered by the persistent epidermis, finally opening by a pore; peridium fragile, not projecting beyond the epidermis; peridial cells oblong, somewhat convex, 9–13 by 29–37 μ , abutted, the outer wall about 4 μ thick, transversely striate, the inner wall thinner, 2–3 μ , closely verrucose; aeciospores ellipsoid or globoid, 19–24 by 24–29 μ ; wall colorless, thick, 2–3 μ , closely and finely verrucose.

ON AMMIACEAE:

Coelopleurum Gmelini (DC.) Ledeb., Alaska.

II. Uredinia hypophyllous, scattered, round, small, about 0.5 mm. in diameter, early naked, golden-brown, pulverulent, ruptured epidermis not apparent; urediniospores globoid or broadly ellipsoid, 19–24 by 23–26 μ ; wall golden- or cinnamon-brown, moderately thick, 1.5–2.5 μ , finely and moderately echinulate, the pores about 6, scattered, indistinct.

III. Telia mostly hypophyllous, scattered, round, 0.5–1 mm. in diameter, early naked, pulverulent, dark chestnut-brown, ruptured epidermis not apparent; teliospores oblong or ellipsoid, often irregular, 16–21 by 24–35 μ , rounded at both ends, slightly or not constricted at septum; wall chestnut-brown, moderately thin, 1.5–2 μ , not thickened at apex, finely verrucose in a few longitudinal lines, the pore apical in upper cell, variously located in the lower; pedicel fragile, very short, colorless.

ON POLYGONACEAE:

Bistorta bistortoides (Pursh) Small (*Polygonum bistortoides* Pursh), Arizona, California, Colorado, Idaho, Montana, Washington, Wyoming.

Polygonum Newberryi Small, Oregon, Washington.

Polygonum spergulariaeforme Meissn. (*P. coarctatum* Dougl.), California.

Polygonum Watsonii Small (*P. imbricatum* Nutt.), Oregon.

TYPE LOCALITY: Ardennes, France, on "renoué bistorte" [*Polygonum Bistorta*].

DISTRIBUTION: Cool habitats in the Rocky Mountains from central Arizona to southeastern Alaska; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz. 2^a: f. 75; Holway, N. Am. Ured. 1: pl. 12, f. 53a, b; Krypt.-fl. Brand. Pilze 3: f. B20; Corda, Ic. Fung. 4: pl. 5, f. 61.

EXSICCATI: Barth. Fungi Columb. 4954; Barth. N. Am. Ured. 224, 532, 1336; Clements, Crypt. Form. Colo. 134; Ellis & Ev. N. Am. Fungi 3568; Sydow, Ured. 1814.

165. *Dicaeoma amphispilum* (Dietel & Holway) Arthur.

Puccinia amphispilusa Dietel & Holway; Dietel, Erythea 3: 79. 1895.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered or circinating, small, round, about 0.5 mm. in diameter, pulverulent, cinnamon-brown; urediniospores broadly ellipsoid, 20–24 by 24–28 μ ; wall light golden-brown, moderately thick, 1.5–2 μ , finely and moderately echinulate, the pores indistinct, 4 or 5, scattered.

III. Telia amphigenous, scattered or circinating, round, 0.5–1 mm. in diameter, only slightly pulverulent, chocolate-brown, ruptured epidermis rather inconspicuous; teliospores oblong or ellipsoid, often somewhat angular and irregular, 18–23 by 27–39 μ , usually rounded at both ends, slightly or not constricted at septum; wall chestnut-brown, 1.5–2 μ thick, thickened over the germ-pores into a small colorless papilla, 3–5 μ , smooth except for a few faint longitudinal striae; pedicel colorless, short, very fragile.

ON POLYGONACEAE:

Polygonum Davisiae Brewer, California.

Polygonum Newberryi Small, California.

TYPE LOCALITY: Lassen County, California, on *Polygonum* [*Newberryi*].

DISTRIBUTION: Mountains of northern California.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 13, f. 54a, b.

166. *Dicaeoma Sommerfeltii* (Johans.) Arthur.

Caeoma Thalictri Sommerf. Suppl. Fl. Lapp. 230. 1826. Not *Dicaeoma Thalictri* Kuntze, 1898.

Aecidium Sommerfeltii Johans. Oefv. Sv. Vet.-Akad. Förh. 41^o: 161. 1885.

Puccinia septentrionalis Juel, Oefv. Sv. Vet.-Akad. Förh. 52: 383. 1895.

Dicaeoma septentrionalis Kuntze, Rev. Gen. 3^a: 470. 1898.

O. Pycnia amphigenous, few, widely scattered, globoid, 120–135 μ in diameter; ostiolar filaments short.

I. Aecia amphigenous, in rather crowded irregular groups on blackened spots, cupulate, small, 0.2–0.3 mm. in diameter; peridium colorless, fragile, the margin finely erose; peridial cells rhombic in radial longitudinal section, 16–23 by 30–38 μ , both walls finely verrucose, the outer usually thicker, 5–8 μ , the inner 4–7 μ ; aeciospores globoid or ellipsoid, 15–17 by 17–22 μ ; wall colorless, thin, about 1 μ , nearly smooth.

ON RANUNCULACEAE:

Thalictrum alpinum L., Alaska.

II. Uredinia hypophyllous, scattered, round, about 0.5 mm. in diameter, early naked, cinnamon-brown, pulverulent; urediniospores globoid or broadly ellipsoid, 19–21 by 23–26 μ ; wall dark cinnamon-brown, 1.5–2.5 μ thick, finely and rather closely echinulate, the pores rather indistinct, 2–4, equatorial or slightly superequatorial.

III. Telia hypophyllous, scattered, circular, 0.5–1 mm. in diameter, early naked, dark chestnut-brown, pulverulent; teliospores ellipsoid, sometimes irregular, 15–23 by 26–40 μ , usually narrowed at both ends, slightly constricted at septum; wall cinnamon- or light chestnut-brown, 1.5–2 μ thick, not thickened at apex except for a prominent hyaline papilla 4–5 μ high over the germ-pore, smooth or with a few faint longitudinal striae; pedicel colorless, short, fragile.

ON POLYGONACEAE:

Bistorta viviparum (L.) S. F. Gray (*Polygonum viviparum* L.), Alaska; Newfoundland.

TYPE LOCALITY: Northland, Sweden, on *Thalictrum alpinum*.

DISTRIBUTION: Boreal stations in Newfoundland and Alaska; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^a: f. 66; Holway, N. Am. Ured. 1: pl. 14, f. 56c; Oefv. Sv. Vet.-Akad. Förh. 41: pl. 29, f. 4, 52: 383, f. 1a–c.

167. *Dicaeoma parcum* Arthur.

Puccinia parca Arth. Bull. Torrey Club 46: 117. 1919.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or irregularly grouped, roundish, 0.3–0.6 mm. across, early naked, brownish-yellow, pulverulent, ruptured epidermis noticeable; urediniospores narrowly ellipsoid or obovoid, 13–16 by 19–26 μ ; wall brownish- or light-yellow, very thin, 1 μ or less, moderately and inconspicuously echinulate, the pores 2–4, equatorial or superequatorial.

III. Telia hypophyllous, scattered or irregularly grouped, roundish, 0.3–1 mm. across, early naked, dark cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; teliospores ellipsoid or oblong, 15–19 by 29–42 μ ; wall cinnamon-brown, rather thin, 1–2 μ , thickened into a hemispheric hyaline papilla over the pores, 4–5 μ , smooth; pedicel colorless, one half length of spore or less, fragile.

ON POLYGONACEAE:

Bilderdykia scandens (L.) Greene (*Polygonum scandens* L., *Tiniaria scandens* Small), New Jersey, New York, North Carolina.

TYPE LOCALITY: Stelton, New Jersey, on *Tiniaria scandens*.

DISTRIBUTION: Atlantic coast from Long Island to western North Carolina.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 13, f. 56a, b.

EXSICCATI: Seym. & Earle, Econ. Fungi 367.

168. *Dicaeoma Polygoni-alpini* (Cruchet & Mayor) Arthur.

Puccinia Polygoni-alpini Cruchet & Mayor; Cruchet, Bull. Herb. Boiss. II. 8: 245. 1908.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered, round, 0.3–1 mm. in diameter, early naked, pulverulent, yellow or brownish-yellow, ruptured epidermis conspicuous; urediniospores globoid or ellipsoid, 18–24 by 23–27 μ ; wall yellowish, rather thick, 1.5–2 μ , finely and closely echinulate, the pores rather indistinct, about 4–6, scattered, sometimes appearing equatorial.

III. Telia amphigenous, mostly hypophyllous, scattered or in loose, circinating groups 3–5 mm. across, round, 0.3–1.5 mm. in diameter, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores ellipsoid or angularly ellipsoid, 16–21 by 22–32 μ , rounded above and below, slightly constricted at septum; wall dark cinnamon-brown, thin, 1–1.5 μ , thickened into a small hyaline umbo over the pores, 1.5–2 μ , closely verrucose in irregular, longitudinal lines 5–7 μ apart; pedicel colorless, fragile.

ON POLYGONACEAE:

Aconogonum phytolaccaefolium (Meissn.) Small (*Polygonum alpinum* Am. Auth.), Idaho, Oregon.

TYPE LOCALITY: Valais mountains, Gries Pass, northern Italy, on *Polygonum alpinum*.

DISTRIBUTION: Alpine stations in Idaho and Oregon; also in Asia and Europe.

169. *Dicaeoma Acetosae* (Schum.) Kuntze, Rev.

Gen. 3³: 467. 1898.

Uredo Acetosae Schum. Enum. Pl. Saell. 2: 231. 1803.

Puccinia Acetosae Körn. Hedwigia 15: 184. 1876.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous and caulicolous, scattered, round, small, 0.3–1 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or ellipsoid, 20–25 by 23–30 μ ; wall light chestnut-brown, moderately thick, 1.5–2.5 μ , sparsely and moderately echinulate, the pores 2, superequatorial.

III. Telia amphigenous and caulicolous, scattered, rounded or oblong on the stems, small, 0.3–1 mm. across, pulverulent, chocolate-brown, ruptured epidermis noticeable; teliospores ellipsoid or oblong, 19–26 by 30–46 μ , rounded at both ends, constricted at septum; wall dark chestnut-brown, thick, 2–3 μ , sometimes with a slight hyaline thickening at apex, 3–5 μ , smooth; pedicel hyaline, slender, deciduous, sometimes as long as spore.

ON POLYGONACEAE:

Rumex Acetosella L., Alabama, California, Florida, Indiana, Massachusetts, New York, Oregon.

Rumex hastatulus Baldw., Florida, Massachusetts, South Carolina.

TYPE LOCALITY: Island of Zealand, Denmark, on *Rumex Acetosa*.

DISTRIBUTION: Along the Atlantic coast from Massachusetts to Florida, and locally in Indiana and Oregon, forming urediniospores only; also in Europe and Asia.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 101; Holway, N. Am. Ured. 1: pl. 12, f. 51 a, b; Krypt.-fl. Brand. Pilze 3: f. B5.

170. *Dicaeoma punctiforme* (Dietel & Holway) Arthur.

Puccinia punctiformis Dietel & Holway; Dietel, Erythea 2: 128. 1894.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, numerous, scattered, not confluent, round, punctiform, up to 0.5 mm. in diameter, rather tardily naked, pulverulent, light-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 18–26 by 26–37 μ ; wall light yellowish-brown, 1–1.5 μ thick, finely and rather sparsely echinulate, the pores 4, equatorial or slightly above the equator.

III. Telia amphigenous, numerous, scattered, occasionally confluent in small groups, punctiform, 0.5–1 mm. in diameter, rather tardily naked, compact, pulvinate, brownish-black, ruptured epidermis conspicuous; teliospores oblong or clavate, 16–23 by 34–51 μ , rounded or truncate above, narrowed below, moderately constricted at septum; wall cinnamon-brown, darker at apex, 1–2 μ thick, thickened to 5–9 μ at apex, smooth; pedicel slightly colored, rather broad, up to 7 μ , about one half length of spore, thin-walled.

ON POLYGONACEAE:

Rumex crispus L., Guatemala.

Rumex hymenosepalus Torr., California.

Rumex mexicanus Meissn., Hidalgo, Mexico (state).

Rumex occidentalis S. Wats., California.

Rumex salicifolius Weinm., California.

TYPE LOCALITY: Berkeley, Alameda County, California, on *Rumex salicifolius*.

DISTRIBUTION: From central California southward through Mexico and Central America.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 11, f. 50 a, b.

EXSICCATI: Barth. N. Am. Ured. 259.

171. *Dicaeoma Oxyriae* (Fuckel) Kuntze, Rev.

Gen. 3³: 469. 1898.

Puccinia Oxyriae Fuckel, Jahrb. Nass. Ver. Nat. 29–30: 14. 1875. *

Puccinia Oxyriae F. B. White; Cooke, Grevillea 11: 15. 1882.

Puccinia Buchanani De-Toni, in Sacc. Syll. 7: 723. 1888.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, numerous, scattered, confluent, at times in groups of three or four, irregular in shape, large, up to 1 mm. across, rather early naked, pulverulent, golden- or cinnamon-brown, ruptured epidermis evident; urediniospores ellipsoid or obovoid, 21–28 by 27–35 μ ; wall golden-brown, thick, 2–2.5 μ , finely and sparsely echinulate, the pores rather indistinct, 4–6, scattered.

III. Telia fairly numerous, scattered, roundish or irregular, large, up to 1.5 mm. across, rather tardily naked, pulvinate, compact, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 18–23 by 32–54 μ , rounded above and below, sometimes narrowed slightly below, moderately constricted at septum; wall light chestnut-brown, 2–3 μ thick, thickened over germ-pores into a broad cap-like tinted umbo, 7–9 μ , the lower cell almost smooth, the upper cell prominently ridged by irregular verrucose markings; pedice hyaline or very pale-yellow, as long as spore or shorter.

ON POLYGONACEAE:

Oxyria digyna (L.) Hill, California, Colorado, Idaho, Oregon, Utah; Alberta, British Columbia.

TYPE LOCALITY: Mountains near St. Maurice, Switzerland, on *Oxyria digyna*.

DISTRIBUTION: Alpine stations from central Colorado and Utah to British Columbia and Alberta.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 102; Holway, N. Am. Ured. 1: pl. 12, f. 52a, b.

172. *Dicaeoma Guillemineae* (Dietel & Holway) Arthur.

Puccinia Guillemineae Dietel & Holway; Holway, Bot. Gaz. 24: 34. 1897.

O. Pycnia not seen.

I. Aecia usually epiphyllous, solitary or usually in small groups on raised areas 0.4–1 mm. in diameter, cupulate or short-cylindric, small, 0.1–0.2 mm. in diameter; peridium whitish,

the margin erect, lacerate; peridial cells rhomboidal, 14–18 by 22–28 μ , overlapping, the outer wall 5–9 μ thick, transversely striate, the inner wall thin, 2–3 μ , coarsely verrucose; aeciospores globoid or ellipsoid, 12–17 by 17–21 μ ; wall pale-yellow, thin, 1 μ , minutely verrucose.

II. Uredinia epiphyllous, few, scattered, oval or roundish, small, 0.1–0.4 by 0.1–0.6 mm., early naked, pulverulent, yellowish-brown, ruptured epidermis noticeable; urediniospores ellipsoid or globoid, 16–19 by 19–23 μ ; wall golden- or cinnamon-brown, 1–2 μ thick, finely verrucose, the pores 3 or 4, equatorial.

III. Telia epiphyllous, numerous, scattered or loosely confluent, roundish or irregular, 0.2–0.6 by 0.2–1 mm., early naked, somewhat pulverulent, blackish-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 19–24 by 29–39 μ , rounded at both ends, usually constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, thicker above, 5–9 μ , smooth; pedicel slightly colored near the spore, two to three times length of spore, narrowed and roughened over its lower portion.

ON AMARANTHACEAE:

Brayulinea densa (Willd.) Small (*Guilleminea illecebroides* H.B.K., *G. densa* Moq.), Jalisco, Hidalgo, Mexico (state).

TYPE LOCALITY: Near City of Mexico, Mexico, on *Guilleminea 'densa*].

DISTRIBUTION: Southern Mexico.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 14, f. 57a, b.

EXSICCATI: Barth. N. Am. Ured. 1246; Sydow, Ured. 1874.

173. *Diaceoma striolatum* (Speg.) Arthur.

Uredo striolata Speg. Anal. Soc. Ci. Argent. 9: 173. 1880.

Puccinia macropoda Speg. Anal. Soc. Ci. Argent. 10: 8. 1880.

Puccinia striolata Arth. Mem. Torrey Club 17: 142. 1918.

O and I. Pycnia and aecia unknown.

II. Uredinia amphigenous, scattered or crowded upon discolored areas, 1–2 mm. in diameter, round or oblong, 0.2–0.5 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid, obovoid or globoid, 18–24 by 24–32 μ ; wall cinnamon-brown, 2–3 μ thick, obliquely and irregularly rugose, the pores 2–4, equatorial or with some of the pores superequatorial.

III. Telia amphigenous but chiefly epiphyllous, grouped or scattered, closely associated with the uredinia, round or oblong, 0.5–1 mm. long, early naked, compact, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong-ellipsoid, 24–31 by 39–51 μ , rounded at both ends, slightly constricted at septum; wall chestnut-brown, thick, 4–5 μ , thickened at apex up to 10 μ , smooth; pedicel colorless, 7 μ in diameter, about twice length of spore.

ON AMARANTHACEAE:

Iresine angustifolia Euphr. (*I. elatior* Rich.), Cuba; Porto Rico; St. Thomas.

Iresine Celosia L. (*I. paniculata* Kuntze), Cuba.

TYPE LOCALITY: Boca del Riachuelo, Argentina, on *Iresine celosioides*.

DISTRIBUTION: West Indies; also in South America.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 14, f. 58a, b.

174. *Dicaeoma* (?) *obesisporum* Arthur.

Puccinia obesispora Arthur, Bull. Torrey Club 45: 147. 1918.

O and I. Pycnia and aecia unknown.

II. Uredinia chiefly hypophyllous, scattered, or confluent on brownish spots, often arranged in circles, round, oval or crescent-shaped, rather small, 0.1–0.6 mm. in diameter, early naked by irregular breaking of the epidermis, pulverulent, cinnamon-brown, ruptured epidermis prominent; urediniospores broadly ellipsoid or globoid, 19–26 by 24–30 μ ; wall dark golden- or cinnamon-brown, variable in thickness, 1.5–3 μ , rather sparsely and strongly echinulate, the pores 2, equatorial.

III. Telia chiefly hypophyllous, scattered, or confluent on brownish spots, round or irregular, 0.1–0.5 mm. in diameter, rather early naked, dark chocolate-brown, ruptured epidermis evident; teliospores ellipsoid, 26–35 by 55–70 μ , rounded, obtuse or acute above, rounded below, slightly or not constricted at septum; wall chocolate-brown, thick, 3–4 μ , thicker at apex, 6–12 μ , coarsely and rather sparsely verrucose; pedicel colorless except near the spore, twice length of spore or less.

This species resembles *Nigredo* (?) *Celosiae* (Dietel & Holway) Arth., except in the possession of two-celled teliospores. The two forms are separately maintained for convenience, but should eventually be united under one name.

ON AMARANTHACEAE:

Achyranthes obovata (Mart. & Gal.) Standley, Oaxaca.

TYPE LOCALITY: Oaxaca, Mexico, on *Achyranthes obovata*.

DISTRIBUTION: Known only from the type locality.

175. *Dicaeoma Rivinae* (Berk. & Curt.) Arthur.

Aecidium Rivinae Berk. & Curt. Jour. Linn. Soc. 10: 358. 1869.

Endophyllum Rivinae Arth. N. Am. Flora 7: 126. 1907.

Puccinia Raunkaerii Ferd. & Winge, Bot. Tidsskr. 29: 8. 1908.

Puccinia Rivinae Speg. Anal. Mus. Nac. Buenos Aires 19: 304. 1909.

O. Pycnia amphigenous, sometimes caulicolous, gregarious on spots with the aecia, honey-yellow becoming brown, globoid, 100–150 μ in diameter; ostiolar filaments short; pycniospores numerous.

I. Aecia amphigenous, caulicolous or petiolicolous, gregarious on brownish spots or upon larger distorted areas, short-cupulate, 0.3–0.6 mm. across; peridium whitish, the margin erect, lacerate; peridial cells rhomboidal, 12–17 by 22–35 μ , the outer wall 4–6 μ thick, smooth, the inner wall thinner, 2–4 μ , verrucose; aeciospores ellipsoid or angular, 15–23 by 26–37 μ ; wall golden- or cinnamon-brown, 1.5–2 μ thick, finely verrucose.

II. Uredinia amphigenous, chiefly epiphyllous, gregarious in small, often concentric groups, roundish, small, 0.3–0.7 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores ellipsoid, 17–23 by 23–30 μ ; wall cinnamon-brown, 1.5 μ thick, sparsely and strongly echinulate, the pores 2, sometimes 3, usually superequatorial.

III. Telia chiefly epiphyllous, numerous, gregarious in small groups, roundish or oval, 0.2–1 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 22–27 by 29–43 μ , rounded above and below, slightly or not constricted at septum; wall cinnamon- or chestnut-brown, 1.5–2 μ thick, uniform, sparsely verrucose; pedicel fragile, 5–10 μ long.

ON PETIVERIACEAE:

Rivina humilis L., Cuba; Porto Rico; St. Thomas.

Rivina octandra L., Cuba; Porto Rico.

TYPE LOCALITY: Cuba, on *Rivina octandra*.

DISTRIBUTION: West Indies; also in South America.

176. *Dicaeoma* (?) *modicum* (Holway) Arthur.

Puccinia modica Holway, Jour. Myc. 10: 164. 1904.

O and I. Pycnia and aecia unknown.

II. Uredinia caulicolous and hypophyllous, sometimes also epiphyllous, scattered, roundish or oblong, 0.2–0.5 by 0.2–0.8 mm., early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or broadly ellipsoid, 18–23 by 19–26 μ ; wall golden-brown, 1.5–2 μ thick, finely and closely verrucose, the pores 3–6, scattered or sometimes approximately equatorial.

III. Telia caulicolous and amphigenous, chiefly hypophyllous, scattered, roundish or irregular, 0.2–0.5 by 0.2–1 mm., early naked, rather pulverulent, chestnut-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid, 23–29 by 29–35 μ , rounded at the ends, usually not constricted at septum; wall chestnut-brown, 3–4 μ thick, sometimes 5 μ , thickened up to 7 μ at apex, smooth; pedicel colorless, stout, up to 100 μ in length; mesospores common, globoid or broadly ellipsoid, 24–29 by 27–32 μ , the wall 3–5 μ thick, thickened up to 7–8 μ at apex.

ON ALSINACEAE:

Arenaria alsinoides Willd., Guatemala.

Arenaria lanuginosa Rohrb., Guatemala.

Arenaria sp., Oaxaca.

TYPE LOCALITY: Etla, Oaxaca, Mexico, on *Arenaria* sp.

DISTRIBUTION: Southern Mexico and Guatemala.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 15, f. 62.

177. *Dicaeoma* (?) *tardissimum* (Garrett) Arthur.*Puccinia tardissima* Garrett, Mycologia 6: 251. 1914.

O and I. Pycnia and aecia unknown.

II. Uredinia caulicolous and amphigenous, numerous, scattered, oblong, 0.2–0.5 by 0.4–1.5 mm., rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; paraphysis-like structures resembling urediniospores also sometimes present; urediniospores ellipsoid, obovoid or globoid, 18–23 by 20–26 μ ; wall golden-brown, 1–2 μ thick, finely echinulate, the pores rather uncertain, usually 3 or 4, approximately equatorial, sometimes apparently 3–6, scattered.

III. Telia caulicolous or amphigenous, few, scattered, oblong, 0.2–0.5 mm. in diameter, rather early naked, chocolate-brown, ruptured epidermis noticeable; teliospores ellipsoid, 18–24 by 26–35 μ , rounded at the ends, slightly constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, uniform, smooth; pedicel colorless, fragile.

ON ALSINACEAE:

Arenaria Burkei Howell (*A. congesta subcongesta* S. Wats.), Colorado.*Arenaria congesta* Nutt., Colorado, Wyoming.*Arenaria Fendleri* A. Gray, New Mexico.*Arenaria laxiflora* Rydb., Colorado.*Arenaria* sp., Utah.TYPE LOCALITY: Wasatch Mountains, Utah, on *Arenaria* sp.

DISTRIBUTION: The central Rocky Mountain region.

EXSICCATI: Barth. N. Am. Ured. 1176; Garrett, Fungi Utah. 242.

178. *Dicaeoma Calthae* (Grev.) Kuntze, Rev. Gen.3³: 468. 1898.*Aecidium Calthae* Grev. Fl. Edin. 446. 1824.*Puccinia Calthae* Link, in Willd. Sp. Pl. 6²: 79. 1825.*Uredo Calthae* Rab. Deutschl. Krypt.-Fl. 1: 5. 1844.*Puccinia elongata* Schroet. Beitr. Biol. Pfl. 3: 61. 1879.

O. Pycnia amphigenous, chiefly hypophyllous, few, loosely gregarious, inconspicuous, honey-yellow becoming brown, flattened-globoid, 144–175 μ in diameter by 80–144 μ high; 1 μ , ostiolar filaments short or wanting.

I. Aecia chiefly hypophyllous or petiolicolous, gregarious in small groups on yellowish spots 1–3 mm. in diameter, cupulate, 0.3–0.4 mm. in diameter; peridium yellowish or whitish, the margin recurved, lacerate; peridial cells ellipsoid, 18–23 by 27–40 μ , slightly overlapping, the outer wall 7–9 μ thick, transversely striate, the inner wall thinner, 3–4 μ , finely and evenly verrucose; aeciospores angularly globoid or ellipsoid, 14–20 by 20–26 μ ; wall colorless, thin, finely and closely verrucose.

II. Uredinia chiefly hypophyllous, scattered or sometimes confluent, roundish or irregular, rather small, 0.1–0.5 by 0.1–0.8 mm., early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores ellipsoid, obovoid, or globoid, 20–26 by 26–32 μ ; wall cinnamon- or golden-brown, rather thin, 1.5 μ , moderately echinulate, the pores 2, very rarely 3, superequatorial and opposite.

III. Telia amphigenous, numerous, scattered or more often confluent, roundish or irregular, small, 0.1–0.5 mm. in diameter, early naked, rather compact, chocolate-brown, ruptured epidermis not conspicuous; teliospores ellipsoid, rather irregular, 15–22 by 32–50 μ , rounded or narrowed at the ends, slightly or not constricted at septum; wall cinnamon-brown, 1.5–2 μ thick, thickened over the pores into a lighter umbo, 3–6 μ , smooth; pedicel pale, fragile.

ON RANUNCULACEAE:

Caltha palustris L., Indiana, Iowa, Michigan, New Jersey, New York, South Dakota, Wisconsin; Ontario.TYPE LOCALITY: Near Edinburgh, Scotland, on *Caltha palustris*.

DISTRIBUTION: Ontario to New Jersey, and westward to South Dakota and Iowa; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 225; Bot. Gaz. 19: pl. 2, f. 4; Holway, N. Am. Ured. 1: pl. 1, f. 1; Corda, Ic. Fung. 4: pl. 4, f. 40.

EXSICCATI: Barth. Fungi Columb. 3836; Barth. N. Am. Ured. 333, 823; Ellis & Ev. Fungi Columb. 190; Ellis & Ev. N. Am. Fungi 2415.

179. *Dicaeoma areolatum* (Dietel & Holway) Kuntze,
Rev. Gen. 3³: 467. 1898.

Puccinia areolata Dietel & Holway; Dietel, Bot. Gaz. 19: 304. 1894.

Alloodus areolata Arth. Résult. Sci. Congr. Bot. Vienne 345. 1906.

O. Pycnia amphigenous, in small groups, minute, punctiform, inconspicuous, globoid, 110–125 μ in diameter by 80–100 μ high, honey-yellow; ostiolar filaments very short.

I. Aecia hypophyllous, in rather loose circular or oval groups on yellowish spots, sometimes annular, 1–4 mm. across, short-cylindric; peridium white, the margin slightly recurved, erose; peridial cells isodiametric or rhombic in longitudinal section, the outer wall 7–8 μ thick, striate, the inner wall 5–7 μ thick, verrucose-striate; aeciospores globoid, 18–24 by 21–26 μ ; wall colorless, about 1 μ thick, very minutely verrucose.

II. Uredinia hypophyllous, single or in small groups scattered on yellowish spots, roundish, small, 0.25–0.3 mm. across, pulvinate, not often naked, opening by apical rupture, slightly pulverulent, cinnamon-brown; urediniospores globoid or obovoid, 20–25 by 25–32 μ ; wall cinnamon-brown, 1.5–2 μ thick, rather finely and closely echinulate, the pores 2, superequatorial.

III. Telia hypophyllous, gregarious, on orbicular pale spots, small, circular, 0.2–0.5 mm. across, often in annular groups 3–5 mm. across, early naked, chocolate-brown, pulverulent, ruptured epidermis noticeable; teliospores oblong or clavate, rarely elliptic, 20–34 by 45–80 μ , often obtuse at both ends, slightly constricted at septum; wall chestnut-brown, 1.5–2 μ thick, smooth or minutely rugose, the pores covered with a pale umbo making the wall 7–9 μ thick; pedicel colorless, fragile, rarely as long as spore.

ON RANUNCULACEAE:

Caltha biflora DC., California, Washington.

Caltha leptosepala DC., Colorado; British Columbia, Saskatchewan.

TYPE LOCALITY: Skamania County, Washington, on *Caltha biflora*.

DISTRIBUTION: From southern British Columbia and central Saskatchewan to central California and Colorado.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 1, f. 4.

EXSICCATI: Barth. N. Am. Ured. 1523.

180. *Dicaeoma calthaecola* (Schroet.) Arth. Résult.
Sci. Congr. Bot. Vienne 344. 1906.

Puccinia calthaecola Schroet. Beitr. Biol. Pfl. 3: 61. 1879.

Puccinia Zopfi Wint. Hedwigia 19: 39. 1880.

Dicaeoma Zopfi Kuntze, Rev. Gen. 3²: 471. 1898.

O. Pycnia amphigenous, few, gregarious in small groups in the center of the groups of aecia.

I. Aecia hypophyllous, gregarious in closely clustered annular or orbicular groups on yellow spots, short-cylindric; peridium whitish, the margin recurved, lacerate; peridial cells rhombic, somewhat overlapping, the outer wall rather thick, 7–8 μ , transversely striate, the inner wall thinner, 2–4 μ , strongly verrucose; aeciospores globoid or ellipsoid, 16–24 by 20–28 μ ; wall thin, finely and closely verrucose.

II. Uredinia amphigenous, chiefly hypophyllous, scattered, roundish, small, 0.1–0.5 mm. in diameter, early naked, pulverulent, cinnamon-brown, ruptured epidermis inconspicuous; urediniospores ellipsoid or obovoid, 20–27 by 24–33 μ ; wall golden- or cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 2 or usually 3, equatorial or slightly super-equatorial.

III. Telia amphigenous, or only hypophyllous, scattered, roundish, small, 0.1–0.5 mm. in diameter, early naked, pulverulent, chocolate-brown, ruptured epidermis not noticeable; teliospores ellipsoid or oblong, 23–30 by 37–51 μ , rounded or obtuse above, rounded or narrowed below, slightly or not constricted at septum; wall chestnut-brown, 2–2.5 μ thick, sometimes thickened at apex into a lighter-colored papilla over the pore, 3–7 μ , inconspicuously but rather coarsely verrucose, appearing smooth when wet; pedicel colorless, fragile, short.

ON RANUNCULACEAE:

Caltha leptosepala DC., Colorado.

Caltha palustris L., Iowa, Michigan, Minnesota, Wisconsin; Manitoba.

TYPE LOCALITY: Black Forest, Germany, on *Caltha [palustris?]*.

DISTRIBUTION: The region of lakes from southern Michigan to Iowa and western Manitoba; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 70; Holway, N. Am. Ured. 1: pl. 1, f. 2.

EXSICCATI: Barth. N. Am. Ured. 1533.

181. *Dicaeoma Ormosiae* Arthur.

Puccinia Ormosiae Arth. Mycologia 9: 78. 1917.

O and I. Pycnia and aecia unknown.

II. Uredinia hypophyllous, scattered or somewhat grouped, round, 0.1–0.5 mm. in diameter, early naked, whitish or chocolate-brown, ruptured epidermis inconspicuous; paraphyses encircling the sorus, branched from near the base, expanding into a large, irregular, botryoid head, nearly colorless, becoming fugacious when old; urediniospores irregularly obovoid, 20–26 by 24–32 μ ; wall chestnut-brown, about 1.5 μ thick, sparsely echinulate with prominent slender echinulations, only one pore, basal, rather obscure.

III. Telia not seen; teliospores in the uredinia, ellipsoid, 23–28 by 29–35 μ , rounded at both ends, moderately constricted at septum; wall chestnut-brown, uniformly about 1.5 μ thick, exclusive of the closely set, large, bead-like warts measuring 2.5–3.5 μ in diameter; pedicel fragile, breaking away close to the spore.

ON FABACEAE:

Ormosia Krugii Urban, Porto Rico.

TYPE LOCALITY: El Yunque, Porto Rico, on *Ormosia Krugii*.

DISTRIBUTION: Porto Rico.

182. *Dicaeoma Oxalidis* (Lév.) Kuntze, Rev. Gen.

3³: 469. 1898.

Uredo Oxalidis Lév. Ann. Sci. Nat. II. 16: 240. 1841.

Uredo Oxalidearum Cooke, Grevillea 10: 123. 1882.

Puccinia Oxalidis Dietel & Ellis; Dietel, Hedwigia 34: 291. 1895.

Aecidium mexicanum Maubl. Bull. Soc. Myc. Fr. 20: 73. 1904. Not *A. mexicanum* Dietel & Holway, 1897.

Aecidium Maublancii Sydow, Monog. Ured. 2: 351. 1904.

Argomyces (?) *Oxalidis* Arth. N. Am. Flora 7: 217. 1912.

O. Pycnia epiphyllous, loosely gregarious in groups 1–3 mm. in diameter, conspicuous, deep-seated, chocolate-brown, ellipsoid-oblong, 110–125 μ wide by 185–225 μ high; ostiolar filaments short, not projecting beyond the ostiole.

I. Aecia hypophyllous, crowded in groups 3–7 mm. in diameter, cornutiform, narrowed above, acute at the apex, 0.2 mm. in diameter, 1–2 mm. high; peridium white, long closed, often breaking off and falling out of the host-tissue; peridial cells square or rhombic, 18–23 by 20–26 μ , abutted or slightly overlapping, the outer wall 9–12 μ thick, transversely striate, the inner wall 1.5–3 μ , closely and finely verrucose; aeciospores angularly globoid or ellipsoid, 11–15 by 13–18 μ ; wall colorless, 1–2 μ thick, closely and finely verrucose, appearing smooth when wet.

ON BERBERIDACEAE:

Mahonia Aquifolium (Pursh) Nutt. (*Berberis Aquifolium* Pursh, *B. repens* Lindl., *B. nana* Greene, *Odostemon Aquifolium* Rydb.), New Mexico.

Mahonia Swaseyi (Buckl.) Fedde (*Berberis trifolia* Schultes, *Odostemon Swaseyi* A Heller), Mexico (state).

II. Uredinia hypophyllous, in orbicular or irregular groups 2–5 mm. across, often covering the whole surface, round, 0.3 mm. across or less, somewhat confluent, soon naked, pale yellowish-white, at first waxy, becoming pulverulent, ruptured epidermis rather inconspicuous; urediniospores globoid or elliptic-globoid, 16–19 by 17–24 μ ; wall very pale-yellow, very thin, 0.8–1 μ , minutely echinulate, the pores uncertain.

III. Telia hypophyllous, in orbicular or irregular groups 2–5 mm. across, often covering the whole surface, round, 0.3 mm. across or less, somewhat confluent, soon naked, very pale brownish-yellow, waxy, ruptured epidermis inconspicuous; teliospores ellipsoid or broadly oblong, 13–20 by 18–28 μ , rounded or obtuse at both ends, slightly or not constricted at septum; wall nearly or quite colorless, smooth, uniformly thin, 0.5–0.8 μ ; pedicel colorless, thick, very short.

ON OXALIDACEAE:

Ionoxalis divaricata Small, Mexico (state).

Ionoxalis latifolia (H.B.K.) Rose (*Oxalis latifolia* H.B.K.), Mexico.

Ionoxalis Martiana (Zucc.) Small (*Oxalis Martiana* Zucc.), Jamaica.

Ionoxalis tetraeuris Small, Mexico (state).

Ionoxalis trinervis Small, Mexico (state).

Ionoxalis vallicola Rose, Mexico (state).

Ionoxalis violacea (L.) Small (*Oxalis violacea* L.), Louisiana, New Mexico, Texas.

Ionoxalis (?) sp. (*Oxalis* sp.), Oaxaca.

TYPE LOCALITY: Mexico, on *Oxalis* sp. [probably *O. latifolia*].

DISTRIBUTION: Louisiana to New Mexico, and southward through Mexico and the West Indies; also in South America.

EXSICCATI: Barth. N. Am. Ured. 1960; Ellis & Ev. N. Am. Fungi 2716.

183. *Dicaeoma Nolitangeris* (Corda) Arthur.

Caeoma (*Uredo*) *Impatientis* Link, Handb. 3: 439. 1833. Not *Dicaeoma Impatientis* Arth. 1906.

Puccinia Nolitangeris Corda, Ic. Fung. 4: 16. 1840.

Uredo Impatientis Rab. Deutschl. Krypt.-Fl. 1: 5. 1844.

Uromyces Impatientis Lév. Ann. Sci. Nat. III. 8: 371. 1847.

Puccinia argentata Wint. in Rab. Krypt.-Fl. 1: 194. 1881. Not *Aecidium argentatum* Schultz, 1806.

Dicaeoma argentatum Kuntze, Rev. Gen. 3: 467. 1898.

O. Pycnia hypophyllous, numerous, scattered, accompanying and intermixed with the aecia, cinnamon-brown, flattened-globoid, 155–190 μ in diameter by 128–160 μ high; ostiolar filaments 45–60 μ long, or less.

I. Aecia hypophyllous and caulicolous, numerous, scattered, from a diffused mycelium, cupulate, 0.3–0.5 mm. broad; peridium whitish, the margin spreading or recurved, coarsely lacerate; peridial cells oblong, 16–30 by 29–40 μ , overlapping, the outer wall 3–5 μ , finely striate, smooth, the inner wall 7–9 μ thick above, thinner below, rugose or verrucose; aeciospores globoid or oblate-spheroid, 15–19 by 16–20 μ ; wall colorless, thin, about 1 μ , closely verrucose.

ON ADOXACEAE:

Adoxa Moschatellina L., Iowa.

II. Uredinia amphigenous, numerous, crowded or scattered, rounded or elliptic, 0.2–0.5 mm. in diameter, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores globoid or broadly ellipsoid, 15–19 by 17–21 μ ; wall thin, 1–1.5 μ , golden- or cinnamon-brown, closely or moderately echinulate, the pores 6–8, scattered.

III. Telia amphigenous, or only hypophyllous, crowded in small groups, rounded or sub-elliptic, 0.2–0.5 mm. in diameter, early naked, pulverulent, dark chestnut-brown, ruptured epidermis scarcely noticeable; teliospores ellipsoid or oblong, 14–21 by 26–37 μ , rounded above, rounded or somewhat acute below, scarcely constricted at septum; wall cinnamon-brown, rather thin, 1.5–2 μ , slightly thickened at apex into a prominent hyaline umbo, 3–5 μ , smooth; pedicel colorless, fragile, about two thirds length of spore or less.

ON BALSAMINACEAE:

Impatiens biflora Walt. (*I. fulva* Nutt.), Delaware, District of Columbia, Illinois, Indiana, Iowa, Minnesota, New Jersey, New York, Ohio, Virginia, West Virginia, Wisconsin.

Impatiens pallida Nutt. (*I. aurea* S. Wats.), Illinois, Iowa.

TYPE LOCALITY: In park at Weltsruss [Bohemia?], on *Impatiens Nolitangere*.

DISTRIBUTION: New York and Minnesota, southward to West Virginia and Illinois; also in Europe and Japan.

ILLUSTRATIONS: Corda, Ic. Fung. 4: pl. 5, f. 57; Krypt.-fl. Brand. Pilze 3: f. B45.

EXSICCATI: Barth. N. Am. Ured. 17; Ellis, N. Am. Fungi 223, 251; Rab.-Paz. Fungi Eur. 4117; Rab.-Wint. Fungi Eur. 2914; Sydow, Ured. 760.

184. *Dicaeoma Violae* (Schum.) Kuntze, Rev. Gen.

3: 471. 1898.

Aecidium Violae Schum. Enum. Pl. Saell. 2: 224. 1803.

Uredo Violae Schum. Enum. Pl. Saell. 2: 233. 1803.

Aecidium Violae Alb. & Schw. Consp. Fung. 118. 1805.

Aecidium Violarum DC. Fl. Fr. 2: 240. 1805.

Aecidium argentatum Schultz, Prodr. Fl. Starg. 454. 1806.

Puccinia Violae DC. Fl. Fr. 6: 62. 1815.

Uredo Violarum DC. Fl. Fr. 6: 73. 1815.

Hypodermium (*Uredo*) *rivosa* Link, Ges. Nat. Freunde Berlin Mag. 7: 27. 1815.

Caeoma Violarum Link, in Willd. Sp. Pl. 6: 25. 1825.

Puccinia Violarum Link, in Willd. Sp. Pl. 6: 80. 1825.

Uredo Albertiniana Spreng. Syst. 4: 572. 1827.

Aecidium bifrons Violarum Wallr. Fl. Crypt. Germ. 2: 251. 1833.

Trichobasis Violarum Berk.; Cooke, Micr. Fungi 210. 1865.

Puccinia Hastatae Cooke, Grevillea 3: 179. 1875.

Puccinia Fergussoni Hastatae De-Toni, in Sacc. Syll. Fung. 7: 682. 1888.

Puccinia densa Dietel & Holway; Dietel, Hedwigia 36: 298. 1897.

O. Pycnia amphigenous, numerous, in groups preceding or accompanying the aecia, noticeable, honey-yellow, flattened-globoid, 80–160 μ in diameter by 64–110 μ high; ostiolar filaments absent.

I. *Aecia* chiefly hypophyllous, sometimes caulicolous or petiolicolous, loosely gregarious, often on larger, slightly discolored spots, sometimes causing thickening of substratum, especially on the veins, cupulate, 0.2–0.4 mm. in diameter; peridium whitish, the margin recurved, lacerate; peridial cells rhombic, 15–26 by 20–35 μ , slightly overlapping, the outer wall 5–9 μ thick, transversely striate, the inner wall thinner, 3–4 μ , verrucose; aeciospores globoid, angular or oblong, 14–19 by 16–26 μ ; wall pale or colorless, thin, 1–1.5 μ , faintly verrucose.

II. *Uredinia* chiefly hypophyllous, numerous, at first in small groups on discolored spots, later scattered, sometimes confluent, roundish or punctate, small, 0.2–0.5 by 0.2–0.6 mm., early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid, obovoid, or ellipsoid, 18–25 by 21–32 μ ; wall golden- or cinnamon-brown, variable in thickness, 1.5–3 μ , occasionally 3.5 μ , moderately echinulate, the pores 2, rarely 3, equatorial.

III. *Telia* amphigenous or petiolicolous, many, scattered or sometimes confluent, roundish, irregular or oblong, 0.2–0.7 by 0.2–1 mm., rather early naked, pulverulent, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid, sometimes pyriform, 17–26 by 27–41 μ (western forms 17–28 by 27–45 μ), rounded or narrowed at the ends, slightly or not constricted at septum; wall cinnamon- or chestnut-brown, moderately thick, 1.5–2.5 μ , in some collections 2–3 μ , thickened above into a lighter-colored, broad umbo over the apical pore, 3–7 μ , faintly or distinctly verrucose, especially on the upper cell (western forms often more noticeably verrucose); pedicel hyaline, fragile, short.

This cosmopolitan species shows some variation throughout North America, none, however, of specific value or constancy.

ON VIOLACEAE:

- Viola adunca* J. E. Smith (*V. arenaria* Am. auth.), California, Colorado, Montana, Nevada, North Dakota, Oregon, Utah, Washington.
Viola adunca glabra Brainerd, Colorado.
Viola adunca longipes Rydb., California, Montana, Utah, Wyoming.
Viola affinis LeConte, Delaware, New York.
Viola arenaria DC., New Hampshire, North Dakota.
Viola blanda Willd., Kentucky, New York, West Virginia.
Viola Brittoniana Pollard, New Jersey.
Viola canadensis L., Colorado, Kentucky, Michigan, Montana, New Mexico, New York, Oregon, South Dakota, Utah.
Viola conspersa Reichenb. (*V. Muhlenbergii* Torr.), Massachusetts, New York, Wisconsin; Quebec.
Viola cucullata Ait., Nebraska, New Jersey, New York, North Carolina, Pennsylvania, Vermont, Virginia.
Viola cucullata prionosepala (Greene) Brainerd, Maine, New York.
Viola cucullata \times *sororia*, New York.
Viola eriocarpa Schw., Illinois, Indiana, Iowa, Maine, Michigan, Missouri, New Hampshire, New York, Ohio; Ontario.
Viola fimbriatula J. E. Smith (*V. ovata* Nutt.), Maine, Massachusetts.
Viola glabella Nutt., California, Idaho, Oregon, Washington.
Viola Grahamei Benth., Hidalgo, Mexico (state).
Viola hastata Michx., North Carolina, Ohio, West Virginia.
Viola hirsutula Brainerd, West Virginia.
Viola hirsutula \times *papilionacea* Brainerd, New York.
Viola incognita Brainerd, Maine, Michigan, Minnesota, New Hampshire, New York.
Viola incognita Forbesii Brainerd, Connecticut, Maine, New York, Ohio.
Viola lanceolata L., Delaware, Maine, Michigan, New York.
Viola missouriensis Greene, Indiana, Missouri.
Viola montanensis Rydb., Colorado, Montana, Washington.
Viola monticola Rydb., Montana.
Viola Nannei Polak., Costa Rica; Guatemala.
Viola nephrophylla Greene (*V. cognata* Greene), California, New Mexico, Oregon, Washington.
Viola ocellata T. & G., California.
Viola Painteri Rose & House, Hidalgo.
Viola pallens (Banks) Brainerd, New York.
Viola palustris L., Alaska, Washington.
Viola papilionacea Pursh, Alabama, Illinois, Indiana, Iowa, Kansas, Massachusetts, Missouri, New York, North Dakota, Oklahoma, South Dakota, Virginia, Wisconsin.
Viola pedatifida G. Don, Colorado, New Mexico.
Viola pratincola Greene, Missouri.
Viola primulifolia L., Alabama, Florida, Maine, Mississippi, New York, Virginia.
Viola pubescens Ait., Indiana, Iowa, Michigan, New York, Vermont, Wisconsin; Ontario.
Viola renifolia A. Gray, Maine, Michigan, Minnesota, Wisconsin.
Viola renifolia Brainerdii (Greene) Fernald, New York.
Viola rostrata Pursh, New York.
Viola rugulosa Greene (*V. Rydbergii* Greene), Colorado, Montana, North Dakota, Oregon, Wyoming.

Viola sagittata Ait., Virginia.

Viola scopulorum (A. Gray) Greene, Colorado.

Viola Selkirkii Pursh, New York, Vermont.

Viola septentrionalis Greene, Maine; Nova Scotia, Ontario.

Viola sororia Willd. (*V. cuspidata* Greene), Indiana, Iowa, Kansas, Missouri; Ontario.

Viola striata Ait., Illinois, Indiana, Missouri, Ohio, West Virginia.

Viola villosa Walt., Alabama.

Viola vittata Greene, Florida.

Viola sp., Maryland; British Columbia; Morelos.

TYPE LOCALITY: Island of Zealand, Denmark, on *Viola canina*.

DISTRIBUTION: Throughout the United States, Canada, and Mexico; also in Europe, Asia, Japan, and South America.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 30, f. 105a, b, pl. 31, f. 105c-h, pl. 32, f. 105i-j; Arth. & Holway, Minn. Bot. Stud. 2: pl. 47, f. 1-8; Beitr. Krypt. Schweiz 2²: f. 106; Krypt.-fl. Brand. Pilze 3: f. B16.

EXSICCATI: Barth, Fungi Columb. 2271, 3577, 3578, 3675, 4168, 4677, 4981, 5080; Barth, N. Am. Ured. 277, 373, 374, 477, 478, 479, 580, 672, 673, 774, 974, 975, 1083, 1084, 1179, 1377, 1478, 1574, 1575, 1676, 1677, 1976, 2176, 2274, 2275; Brenckle, Fungi Dak. 245, 370, 419; Clements, Crypt. Form. Colo. 581; Ellis, N. Am. Fungi 254, 1007; Ellis & Ev. Fungi Columb. 349, 350, 496, 2075; Ellis & Ev. N. Am. Fungi 2411; Garrett, Fungi Utah. 48, 54, 243; Kellerm. Ohio Fungi 96, 132, 154, 155; Seym. & Earle, Econ. Fungi 456a, b, c; Sydow, Ured. 1520, 1618, 1784, 1833.

185. *Dicaeoma Epilobii-tetragoni* (DC.) Arthur.

Uredo vagans Epilobii-tetragoni DC. Fl. Fr. 2: 228. 1805.

Aecidium Epilobii DC. Fl. Fr. 2: 238. 1805.

Uredo Epilobii DC. Fl. Fr. 6: 73. 1815.

Puccinia pulverulenta Grev. Fl. Edin. 432. 1824.

Caeoma Epilobii Link, in Willd. Sp. Pl. 6²: 59. 1825.

Caeoma epilobiatum Link, in Willd. Sp. Pl. 6²: 59, in part. 1825.

Puccinia tenuistipes Opiz, Seznam 139; hyponym. 1852.

Trichobasis Epilobii Berk.; Cooke, Micr. Fungi 210. 1865.

Puccinia Gayophyti Billings, in S. Wats. Bot. King's Expl. 414. 1871.

Puccinia Oenotherae Vize, Grevillea 5: 109. 1877.

Aecidium Gayophyti Vize, Grevillea 7: 12. 1878.

Puccinia Epilobii-tetragoni Wint. in Rab. Krypt.-Fl. 1: 214. 1881.

Puccinia Boisduvaliae Peck, Bot. Gaz. 7: 45. 1882.

Puccinia Gayophyti Peck, Bot. Gaz. 7: 56. 1882.

Puccinia Clarkiae Peck, Bull. Torrey Club 11: 49. 1884.

Puccinia Epilobii Schroet. Krypt.-Fl. Schles. 1: 319. 1887.

Puccinia intermedia Dietel & Holway; Dietel, Bot. Gaz. 18: 254. 1893.

Puccinia heterantha Ellis & Ev. Erythea 1: 204. 1893.

Puccinia Eulobi Dietel & Holway; Dietel, Erythea 1: 249. 1893.

Aecidium Clarkiae Dietel & Holway; Dietel, Erythea 2: 129. 1894.

Puccinia Sphaerostigmatis Dietel & Neger, Bot. Jahrb. 22: 353. 1896.

Dicaeoma Boisduvaliae Kuntze, Rev. Gen. 3³: 468. 1898.

Dicaeoma Clarkiae Kuntze, Rev. Gen. 3³: 468. 1898.

Dicaeoma Gayophyti Kuntze, Rev. Gen. 3³: 468. 1898.

Dicaeoma heteranthum Kuntze, Rev. Gen. 3³: 469. 1898.

Dicaeoma intermedium Kuntze, Rev. Gen. 3³: 469. 1898.

Dicaeoma Oenotherae Kuntze, Rev. Gen. 3³: 469. 1898.

Puccinia Gayophyti Speg. Anal. Mus. Nac. Buenos Aires III. 1: 63. 1902.

Puccinia Zauschneriae Sydow, Monog. Ured. 1: 435. 1903.

Puccinia glabella Holway, N. Am. Ured. 1: 76. 1907.

O. Pycnia amphigenous, among or opposite the aecia, scattered, inconspicuous, honey-yellow becoming brown, globoid, 85–150 μ in diameter by 110–170 μ high; ostiolar filaments 30–65 μ long.

I. Aecia amphigenous, chiefly hypophyllous, scattered, from a diffused mycelium, numerous, often covering the entire leaf-surface, cupulate or sometimes short-cylindric, 0.2–0.5 mm. across; peridium white, the margin recurved, lacerate; peridial cells rhomboidal, 13–22 by 22–36 μ , overlapping, the outer wall 5–10 μ thick, transversely striate, the inner wall thinner, 3–6 μ , moderately verrucose; aeciospores irregularly globoid, angular, or ellipsoid, 13–20 by 13–23 μ , (usually only up to 20 μ in length); wall colorless, thin, 1 μ , minutely verrucose.

II. Uredinia amphigenous, often only hypophyllous, numerous, scattered, occasionally confluent, roundish, small, 0.1–0.8 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores ellipsoid, obovoid or globoid, flattened slightly on two opposite sides, 15–26 by 19–31 μ ; wall cinnamon-brown, somewhat variable in thickness, 1.5–3 μ , moderately or sometimes closely echinulate, the pores 2, equatorial, rarely slightly superequatorial, in lighter-colored areas in the flattened sides.

III. Telia amphigenous, sometimes caulicolous, numerous, scattered or sometimes confluent, roundish, rather small, 0.2–1 mm. across, early naked, pulverulent or sometimes com-

pact, dark chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid or obovoid, 14–27 by 23–50 μ , rounded or somewhat narrowed at one or both ends, somewhat variable upon different hosts, usually somewhat constricted at septum; wall cinnamon- or chestnut-brown, 1.5–3 μ thick, occasionally up to 4 μ , thicker above, 4–12 μ , sometimes finely and inconspicuously verrucose; pedicel pale, rather fragile, usually broken away, but sometimes twice the length of spore.

This species agrees morphologically with *Nigredo plumbaria* (Peck) Arth., except in the possession of two-celled teliospores, and the two should eventually be united under one name.

ON ONAGRACEAE:

- Boisduvalia densiflora* (Lindl.) S. Wats., California.
Boisduvalia densiflora imbricata Greene, California.
Boisduvalia glabella (Nutt.) Walp., Idaho, Nevada, Oregon.
Boisduvalia salicina (Nutt.) Rydb., Idaho, Oregon, Washington.
Boisduvalia sparsiflora A. Heller, California.
Boisduvalia stricta (A. Gray) Greene (*B. Torreyi* S. Wats.), Oregon.
Chamaenerion latifolium (L.) Sweet (*Epilobium latifolium* L.), Alaska.
Chylisma cardiophylla (Torr.) Small (*Oenothera cardiophylla* Torr.), California.
Chylisma hirta A. Nelson, Nevada.
Chylisma scapoidea seorsa A. Nelson, Idaho.
Clarkia amoena (Lehm.) Nelson & Macbr. (*Godetia amoena* G. Don), California, Oregon.
Clarkia biloba (Durand) Nelson & Macbr. (*Godetia biloba* S. Wats.), California.
Clarkia elegans Dougl. (*Phaeostoma elegans* A. Nelson), California.
Clarkia epilobioides (Nutt.) Nelson & Macbr. (*Godetia epilobioides* S. Wats.), Nevada, Washington.
Clarkia pulchella Pursh, Idaho, Oregon, Washington.
Clarkia rhomboidea Dougl. (*Phaeostoma rhomboidea* A. Nelson), California, Washington.
Clarkia superba Nelson & Macbr. (*Godetia grandiflora* Lindl.), California.
Epilobium adenocaulon Hausskn., Montana, New Mexico, Washington.
Epilobium americanum Hausskn., Idaho, Washington.
Epilobium Bongardi Hausskn., Alaska.
Epilobium clavatum Trel., Montana.
Epilobium franciscanum Barbey, California.
Epilobium glandulosum Lehm., Alaska.
Epilobium minutum Lindl., Oregon; British Columbia.
Epilobium paniculatum Nutt., California, Colorado, Idaho, Montana, Nevada, North Dakota, Oregon, South Dakota, Utah, Washington, Wyoming.
Epilobium sp., Saskatchewan.
Eulobus californicus Nutt., California.
Gayophytum caesium T. & G., Idaho, Nevada, Utah, Washington, Wyoming.
Gayophytum diffusum T. & G., California, Idaho, Utah.
Gayophytum Helleri Rydb., Idaho.
Gayophytum lasiospermum Greene, Utah.
Gayophytum Nuttallii T. & G., Idaho.
Gayophytum pumilum S. Wats., California, Idaho.
Gayophytum racemosum T. & G., Arizona, Colorado, Idaho.
Gayophytum ramosissimum T. & G. (*G. intermedium* Rydb.), California, Colorado, Idaho, Montana, New Mexico, Oregon, Utah, Wyoming.
Oenothera strigosa (Rydb.) Mackenzie & Bush, Montana.
Sphaerostigma alyssoides (H. & A.) Walp. (*Oenothera alyssoides* H. & A.), Idaho.
Sphaerostigma andinum (Nutt.) Walp. (*Oenothera andina* Nutt.), Idaho, Washington.
Sphaerostigma bistorta (Nutt.) Walp. (*Oenothera bistorta* Nutt.), California.
Sphaerostigma Boothii (Dougl.) Walp. (*Oenothera Boothii* Dougl.), Oregon, Washington.
Sphaerostigma contortum (Dougl.) Walp. (*Oenothera contorta* Dougl.), California, Washington.
Sphaerostigma decorticans (H. & A.) Small (*Oenothera gauraefolia* T. & G.), California.
Sphaerostigma dentatum (Cav.) Walp. (*Oenothera dentata* Cav.), Oregon.
Sphaerostigma hirtellum (Greene) Small (*Oenothera hirtella* Greene), California.
Sphaerostigma micranthum (Hornem.) Walp. (*Oenothera micrantha* Hornem.), California.
Sphaerostigma pubens (S. Wats.) Rydb. (*Oenothera strigulosa pubens* S. Wats.), California.
Sphaerostigma spirale (Lehm.) Walp. (*Oenothera spiralis* Hook.), California.
Sphaerostigma utahense Small, Utah.
Sphaerostigma Veitchianum (Hook.) Small (*Oenothera bistorta Veitchiana* Hook.), California.
Sphaerostigma viridescens (Lehm.) Walp. (*Oenothera viridescens* Lehm.), California.
Sphaerostigma sp., Arizona.
Taraxia breviflora Nutt., Montana.
Taraxia graciliflora (H. & A.) Raim. (*Oenothera graciliflora* H. & A.), California.
Taraxia longiflora Nutt. (*Oenothera Nuttallii* T. & G.), Nevada.
Taraxia ovata (Nutt.) Small (*Oenothera ovata* Nutt.), California.
Taraxia subacaulis (Pursh) Rydb. (*T. heterantha* Small, *Oenothera heterantha* Nutt.), Colorado, Idaho, Montana, Nevada, Utah, Wyoming.
Zauschneria californica Presl, California.
Zauschneria Garrettii A. Nelson, Utah.

TYPE LOCALITY: France, on *Epilobium tetragonum*.

DISTRIBUTION: From the western part of the Dakotas westward to the coast, and from Alaska to New Mexico and California; also in Europe, Asia, Australia, and South America.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl.* 33, *f.* 113*a, b*; *pl.* 34, *f.* 113*c-e*, 114, 115*a, b*; *pl.* 35, *f.* 115*c-h*; *pl.* 36, *f.* 116, 117; Beitr. Krypt. Schweiz 2: *f.* 118; Krypt.-fl. Brand. Pilze 3: *f.* B18; Corda, Ic. Fungi. 1: *pl.* 2, *f.* 95; 4: *pl.* 4, *f.* 51.

EXSICCATI: Barth. Fungi Columb. 2469, 2558, 2771, 3750, 3752, 4767, 4859; Barth. N. Am. Ured. 159, 295, 341, 356, 438, 439, 856, 953, 1148, 1252, 1262, 1350, 1359, 1440, 1589, 1958, 2052, 2144; Clements, Crypt. Form. Colo. 561; Ellis, N. Am. Fungi 1060, 1426; Ellis & Ev. Fungi Columb. 553, 554, 1074, 1289, 1300, 1851; Ellis & Ev. N. Am. Fungi 1846, 2986, 2995, 3139, 3140, 3477, 3580; Garrett, Fungi Utah. 49, 50, 86, 92, 110, 145, 162, 173; D. Griff. W. Am. Fungi 381, 383, 383*a*, 385; Sydow, Ured. 864, 865, 866, 874, 875, 881, 1063, 1064, 1768, 1918, 1919.

186. *Dicaeoma Proserpinacae* (Berk. & Curt.) Kuntze,
Rev. Gen. 3³: 470. 1898.

Aecidium Proserpinacae Berk. & Curt.; Berk. Grevillea 3: 60. 1874.

Puccinia Epilobii Proserpinacae Farl.; Ellis, N. Am. Fungi 260; hyponym. 1879.

Puccinia Proserpinacae Farl. Proc. Am. Acad. 18: 80. 1883.

O. Pycnia amphigenous, scattered, becoming brown, globoid, 140–180 μ in diameter by 120–165 μ high; ostiolar filaments short, 15–25 μ .

I. Aecia chiefly hypophyllous, scattered over the leaf without spots, cupulate, small, 0.1–0.2 mm. in diameter; peridium whitish, the margin recurved, lacerate; peridial cells rhomboidal, 16–26 by 29–39 μ , overlapping, the outer wall 5–9 μ , transversely striate, the inner wall 3–6 μ , verrucose; aeciospores globoid or ellipsoid, 15–19 by 18–23 μ ; wall colorless, 1–1.5 μ thick, faintly verrucose.

II. Uredinia hypophyllous, few, scattered, or sometimes in groups and confluent, on small spots 1–2 mm. in diameter, roundish, small, brownish; urediniospores ellipsoid or globoid, 18–24 by 21–29 μ ; wall golden- or cinnamon-brown, 1–2 μ thick, moderately echinulate, the pores 2, equatorial or superequatorial.

III. Telia amphigenous, scattered, roundish, small, 0.2–0.5 mm. in diameter, early naked, compact, pulvinate, cinnamon-brown, ruptured epidermis not noticeable; teliospores ellipsoid, cylindric or clavate, 13–20 by 35–58 μ , usually rounded above, narrowed below, slightly or considerably constricted at septum; wall golden- or cinnamon-brown, thin, 1–1.5 μ , 5–8 μ at apex, lighter, smooth; pedicel hyaline, length of spore or less.

ON HALORAGIDACEAE:

Proserpinaca palustris L., Illinois, Massachusetts, New York, Wisconsin.

Proserpinaca pectinata Lam., Massachusetts.

Proserpinaca sp., Alabama.

TYPE LOCALITY: Alabama, on *Proserpinaca* sp.

DISTRIBUTION: Massachusetts to Wisconsin, and southward to Alabama.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl.* 36, *f.* 120.

EXSICCATI: Barth. N. Am. Ured. 1002; Ellis, N. Am. Fungi 260; Ellis & Ev. Fungi Columb. 1579.

187. *Dicaeoma Pimpinellae* (Strauss) Kuntze, Rev.
Gen. 3³: 470. 1898.

Uredo Pimpinellae Strauss, Ann. Wett. Ges. 2: 102. 1810.

Puccinia Pimpinellae H. Mart. Fl. Mosq. ed. 2: 226. 1817.

Caeoma Umbelliferarum Schlecht. Fl. Berol. 2: 115. 1824.

Puccinia Pimpinellae Link, in Willd. Sp. Pl. 6²: 77. 1825.

Caeoma (*Uredo*) *Anemonis* Schw. Trans. Am. Phil. Soc. II. 4: 291. 1832.

Caeoma (*Uredo*) *Chelidonii* Schw. Trans. Am. Phil. Soc. II. 4: 291. 1832.

Puccinia Myrrhis Schw. Trans. Am. Phil. Soc. II. 4: 296. 1832.

Aecidium Pimpinellae L. Kirchn. Lotos 6: 180. 1856.

Aecidium Osmorrhizae Peck, Ann. Rep. N. Y. State Mus. 24: 92. 1872.

Puccinia Osmorrhizae Cooke & Peck; Peck, Ann. Rep. N. Y. State Mus. 29: 73. 1878.

Uredo (*Caeoma*) *Chelidonii* Schw.; De-Toni, in Sacc. Syll. Fung. 7: 863. 1888.

Puccinia Trifoliatae Ellis & Ev. Bull. Torrey Club 22: 58. 1895.

Dicaeoma Trifoliatae Kuntze, Rev. Gen. 3³: 471. 1898.

O. Pycnia amphigenous, few, scattered, rather inconspicuous, honey-yellow becoming dark-brown, globoid or flask-shaped, 90–128 μ wide by 80–144 μ high; ostiolar filaments up to 80 μ long, usually agglutinated into a column.

I. Aecia hypophyllous or petiolicolous, more or less confluent in irregular elongate or circular groups, low, flattened-hemispheric, 0.2–0.5 mm. in diameter, opening at first by a small pore, later becoming wide open; peridium at first yellow, turning darker, the margin recurved, irregular; peridial cells oblong, 19–26 by 27–39 μ , abutted or slightly overlapping, the walls of about equal thickness, 3–5 μ , verrucose, the inner wall more coarsely marked than

the outer; aeciospores angularly globoid or broadly ellipsoid, 15–21 by 19–29 μ ; wall very pale-yellow or colorless, 2–2.5 μ thick, finely and closely verrucose.

II. Uredinia hypophyllous, petioliculous, not especially numerous, scattered, sometimes confluent on petioles into small elongate groups, round or elongate, rather small, 0.2–0.5 mm. in diameter, early naked, pulverulent, golden-brown, ruptured epidermis evident; urediniospores globoid or obovoid, 16–24 by 21–30 μ ; wall yellow or cinnamon-brown, 1.5–3 μ thick, finely echinulate, appearing almost smooth in lower portion, coarsely echinulate in upper portion; pores rather indistinct, probably 3, slightly superequatorial.

III. Telia amphigenous, numerous, scattered or confluent in groups up to 1.5 mm. in diameter, round or irregularly shaped, 0.2–0.8 mm. across, early naked, pulverulent, dark-brown, ruptured epidermis not noticeable; teliospores ellipsoid, 18–26 by 26–37 μ , rounded above and below, only slightly constricted at septum; wall chestnut-brown, 2–3 μ thick, not thickened at apex, reticulated with meshes 1.5–2 μ in diameter, sometimes appearing finely verrucose; pedicel hyaline, fragile.

ON AMMIACEAE:

Chaerophyllum procumbens (L.) Crantz, District of Columbia, Kentucky, Missouri, Ohio, Pennsylvania.

Glycosma occidentalis Nutt. (*Washingtonia occidentalis* Coult. & Rose, *Osmorrhiza occidentalis* Torr.), California, Colorado, Montana, Oregon, Utah.

Osmorrhiza brevipes (Coult. & Rose) Suksd. (*Washingtonia brevipes* Coult. & Rose), California, Oregon, Washington.

Osmorrhiza Claytoni (Michx.) Clarke, (*O. brevistylis* DC. *Myrrhis Claytoni* Michx., *Washingtonia Claytoni* Britton), Connecticut, Delaware, Iowa, Michigan, Missouri, New York, Ohio, Pennsylvania, West Virginia, Wisconsin; Ontario, Quebec.

Osmorrhiza divaricata Nutt. (*Washingtonia divaricata* Britton), Michigan, Montana, Oregon, Washington.

Osmorrhiza intermedia (Rydb.) Blankinship, Washington.

Osmorrhiza Leibergii (Coult. & Rose) Blankinship, Oregon.

Osmorrhiza longistylis (Torr.) DC. (*Washingtonia longistylis* Britton), Connecticut, Iowa, Kentucky, Maryland, Michigan, Missouri, Nebraska, New York, Ohio, Virginia, West Virginia, Wisconsin; Ontario.

Osmorrhiza nuda Torr. (*Washingtonia nuda* A. Heller), California, Montana, Utah, Washington.

Osmorrhiza obtusa (Coult. & Rose) Fernald (*Washingtonia obtusa* Coult. & Rose), Utah.

Osmorrhiza sp., South Dakota.

TYPE LOCALITY: Europe, on *Pimpinella Saxifraga*.

DISTRIBUTION: From Connecticut southward to Maryland and west to the Pacific coast; also in Europe, Asia Minor, India, and Algeria.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 97; Holway, N. Am. Ured. 1: pl. 38, f. 125a, b, c; Krypt.-fl. Brand. Pilze 3: f. B39.

EXSICCATI: Barth. Fungi Columb. 3174, 3361, 3950, 3951, 3952, 4156, 4971; Barth. N. Am. Ured. 51, 160, 357, 559, 650, 755, 756, 1360, 1769, 1770, 1959; Ellis & Ev. Fungi Columb. 341, 1770, 1772; Ellis, N. Am. Fungi 1040a, c, 1460; Garrett, Fungi Utah. 21, 32, 33, 188, 235; Kellerm. Ohio Fungi 110, 111, 112, 113, 114; Sydow, Ured. 1347, 1778, 1932, 2472, 2530; Thüm. Myc. Univ. 1327.

188. *Dicaeoma Pseudocymopteri* (Holway) Arthur.

Puccinia Pseudocymopteri Holway, N. Am. Ured. 1: 91. 1913.

O. Pycnia amphigenous or cauliculous, rather few, scattered among the aecia, small, punctiform, honey-yellow, turning brown, globoid, 80–112 by 80–128 μ ; ostiolar filaments not seen.

I. Aecia amphigenous or cauliculous, scattered or clustered in small groups, at first hemispheric, opening by a pore, finally forming shallow cups up to 0.5 mm. across; peridium pale-yellow or colorless, the margin recurved, finally broken irregularly and lacerate; peridial cells oblong, 24–32 by 29–45 μ , the walls of even thickness, 5–7 μ , the inner wall finely verrucose; aeciospores broadly ellipsoid or obovoid, 16–21 by 21–29 μ ; wall pale-yellow, rather uniform in thickness, about 1.5 μ , finely and closely verrucose.

II. Uredinia amphigenous or cauliculous, numerous, scattered, confluent on stems, round or irregular, up to 0.7 mm. across, covered at first, later naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or globoid, 16–26 by 23–32 μ ; wall pale- or cinnamon-brown, 1.5–2 μ thick, finely echinulate, the pores rather indistinct, appearing equatorial.

III. Telia amphigenous or cauliculous, numerous, scattered, confluent on stems, irregularly round, rather indefinite, up to 0.4 mm. in diameter, tardily naked, pulverulent, dark-brown, ruptured epidermis not noticeable; teliospores broadly ellipsoid, 19–23 by 27–35 μ ,

rounded above and below, only slightly constricted at septum; wall chestnut-brown, uniformly thick, 1–1.5 μ , irregularly rugose or sometimes longitudinally rugose; pedicel hyaline, fragile, not longer than spore.

ON AMMIACEAE:

Leptotaenia Eatoni Coult. & Rose, Montana.

Pseudocymopterus montanus (A. Gray) Coult. & Rose, Colorado, New Mexico, Utah.

Pseudocymopterus multifidus Rydb., New Mexico.

Pseudoreoxis bipinnatus (S. Wats.) Rydb. (*Pseudocymopterus bipinnatus* Coult. & Rose), Montana.

TYPE LOCALITY: Ouray, Colorado, on *Pseudocymopterus montanus*.

DISTRIBUTION: New Mexico northward to Montana.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 42, f. 138a, b.

EXSICCATI: Garrett, Fungi Utah. 219.

189. *Dicaeoma Cicutae* (Lasch) Kuntze, Rev. Gen. 3³: 468.
1898.

Puccinia Cicutae Lasch; Klotzsch, Herb. Viv. Myc. 787. 1845.

O. Pycnia petiolicolous, sometimes amphigenous, occurring between the aecia, yellowish, flattened-globoid, 100–125 μ in diameter by 70–90 μ high; ostiolar filaments short, up to 35 μ .

I. Aecia caulicolous, petiolicolous, or amphigenous, often on the veins of the leaves, gregarious in oval or oblong groups, pustulate, low-cupulate, 0.4–0.6 mm. across; peridium whitish, the margin erect, erose; peridial cells oblong, 16–29 by 32–45 μ , slightly overlapping, the outer wall 5–10 μ thick, smooth, transversely striate, the inner wall thinner, 3–5 μ , rather coarsely verrucose; aeciospores globoid or broadly ellipsoid, 15–20 by 18–27 μ ; wall pale-yellow, 1–1.5 μ thick, minutely verrucose.

II. Uredinia amphigenous, especially hypophyllous, scattered, roundish or oval, 0.3–1 mm. across, rather early naked by an irregular rupture of the epidermis, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or ellipsoid, 16–23 by 21–30 μ ; wall light cinnamon-brown, 1–2 μ thick, moderately echinulate, the pores 3, equatorial.

III. Telia amphigenous, chiefly hypophyllous, scattered, occasionally confluent, roundish or elliptic, small, 0.3–1.2 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis evident; teliospores broadly ellipsoid or oblong, 19–26 by 28–40 μ , rounded at both ends, somewhat constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, uniform, or sometimes up to 4 μ at apex, coarsely verrucose, the markings sometimes in longitudinal lines; pedicel colorless, fragile, sometimes as long as spore, often inserted somewhat laterally.

ON AMMIACEAE:

Cicuta Bolanderi A. Gray, California.

Cicuta californica A. Gray, California.

Cicuta Curtissii Coult. & Rose, Florida.

Cicuta maculata L., New York, Wisconsin; Manitoba. Nova Scotia.

Cicuta occidentalis Greene, California, Idaho, Oregon.

Cicuta vagans Greene, Nevada.

TYPE LOCALITY: Oriesen, Germany, on *Cicuta virosa*.

DISTRIBUTION: Along the Atlantic coast from Nova Scotia to Florida, and locally in the central and western parts of the United States; also in Europe and Asia.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 39, f. 129a, b; Krypt.-fl. Brand. Pilze 3: f. B34.

EXSICCATI: Barth. Fungi Columb. 4753; D. Griff. W. Am. Fungi 376.

190. *Dicaeoma marylandicum* (Lindr.) Arthur.

Puccinia marylandica Lindr. Medd. Stockh. Högsk. Bot. Inst. 4⁹: 2. 1901.

O. Pycnia amphigenous, crowded in small groups, punctiform, indistinct, honey-yellow becoming brown, immersed, globoid, about 80 μ in diameter and 110 μ in depth; ostiolar filaments 40–50 μ long.

I. Aecia hypophyllous or petiolicolous, crowded in small orbicular groups 2–4 mm. across, cylindric, short, 0.1–0.2 mm. in diameter; peridium white, delicate, the margin recurved, lacerate; peridial cells rhombic, 15–26 by 24–39 μ , overlapping considerably, the outer wall 3–5 μ thick, transversely striate, the inner wall 5–7 μ thick, verrucose; aeciospores angularly globoid, 15–23 by 16–25 μ ; wall very pale-yellow or colorless, 1–1.5 μ thick, finely, closely and rather inconspicuously verrucose.

II. Uredinia amphigenous, numerous, scattered, roundish, 0.1–0.2 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly

ellipsoid or obovoid, 19–28 by 23–30 μ ; wall yellowish or cinnamon-brown, 2–4 μ thick, sparsely and evenly echinulate, the pores 2 or 3, equatorial, often indistinct.

III. Telia amphigenous, scattered or confluent in small groups of two or three, roundish or irregular, up to 0.4 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis rather inconspicuous; teliospores ellipsoid, 19–26 by 28–42 μ , rounded above and below, slightly constricted at septum; wall dark cinnamon-brown, uniformly thick, 1.5–2 μ , reticulate with meshes about 1 μ in diameter, giving the appearance of being minutely and closely verrucose, the pore of upper cell usually apical, of lower cell depressed often near pedicel; pedicel hyaline, shorter than spore, fragile.

ON AMMIACEAE:

Sanicula canadensis L., West Virginia.

Sanicula floridana Bickn., Florida.

Sanicula marylandica L., Saskatchewan.

Sanicula sp., Delaware, Indiana, Iowa, Missouri, New York, Pennsylvania, South Carolina, South Dakota, Wisconsin; British Columbia, Quebec.

TYPE LOCALITY: North America [Wisconsin?], on *Sanicula marylandica*.

DISTRIBUTION: Quebec southward to Florida and westward to the foothills of the Rocky Mountains, as well as in British Columbia.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: pl. 37, f. 125a, b, c.

EXSICCATI: Barth. N. Am. Ured. 765; Rav. Fungi Car. 4: 90.

191. *Dicaeoma Arracacharum* (Lindr.) Arthur.

Caeoma Arracacharum Lindr. Medd. Stockh. Högsk. Bot. Inst. 4^o: 1. 1901.

Puccinia Arracachae Lagerh. & Lindr.; Lindr. Medd. Stockh. Högsk. Bot. Inst. 4^o: 5. 1901.

Puccinia Arracacharum Arth. Am. Jour. Bot. 5: 476. 1918.

O. Pycnia usually epiphyllous, few, in small groups 0.1–0.3 mm. in diameter, noticeable, chestnut-brown, globoid, 150–220 μ in diameter; ostiolar filaments 80–96 μ long, not projecting beyond the ostiole.

I. Aecia amphigenous, in groups of 2–6 with the pycnia, round, very small, 0.1 mm. or less in diameter; peridium wanting, the aecia bounded by a thin layer of mycelium; aeciospores angularly ellipsoid or oblong, 18–23 by 24–35 μ ; wall colorless, 2–2.5 μ thick, variably verrucose, sometimes appearing echinulate.

II. Uredinia hypophyllous, scattered, round, 0.2–0.5 mm. across, early naked, pulverulent, yellow or pale cinnamon-brown, ruptured epidermis evident; urediniospores ellipsoid or obovoid, 18–24 by 29–37 μ ; wall colorless or yellowish, moderately thick, 1.5–2.5 μ , closely echinulate, the pores obscure.

III. Telia hypophyllous, scattered, round, 0.4–0.6 mm. across, early naked, pulvinate, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid or oblong, 21–29 by 34–51 μ , rounded above, slightly narrowed below, slightly constricted at septum, germinating at maturity; wall cinnamon-brown, thin, 1–2 μ , thickened at apex, 5–10 μ , smooth; pedicel colorless, up to one and a half times length of spore, tapering toward the base.

ON AMMIACEAE:

Arracacia bracteata Coult. & Rose, Guatemala.

TYPE LOCALITY: Ecuador, on *Arracacia* sp.

DISTRIBUTION: Guatemala; also in South America.

192. *Dicaeoma obscuratum* (Arth. & Holway) Arthur.

Puccinia obscurata Arth. & Holway; Arth, Am. Jour. Bot. 5: 477. 1918.

O and I. Pycnia and aecia unknown.

II. Uredinia usually hypophyllous, scattered, round or oval, 0.1–0.8 mm. across, early naked, pulverulent, pale cinnamon-brown, ruptured epidermis evident; urediniospores globoid or obovoid, 18–26 by 24–29 μ ; wall colorless or light-yellow, moderately thick, 1.5–2.5 μ , closely echinulate, the pores 2 or 3, usually 2, equatorial, rather indistinct.

III. Telia hypophyllous, scattered, round, 0.1–0.3 mm. across, early naked, somewhat pulverulent, chestnut-brown, ruptured epidermis evident; teliospores broadly ellipsoid or oblong, 23–31 by 30–40 μ , rounded above and below, slightly or not constricted at septum; wall cinnamon-brown, thin, 1–1.5 μ , thickened at apex, 3–7 μ , smooth; pedicel colorless, fragile, longer than spore.

ON AMMIACEAE:

Neonelsonia ovata Coult. & Rose, Guatemala.TYPE LOCALITY: Volcan de Agua, Antigua, Guatemala, on *Neonelsonia ovata*.

DISTRIBUTION: Known only from the type locality.

193. *Dicaeoma Ortonii* (H. S. Jackson) Arthur.*Puccinia Ortonii* H. S. Jackson, Brooklyn Bot. Gard. Mem. 1: 259. 1918.

O. Pycnia epiphyllous, few, crowded in small groups 1–2 mm. in diameter, inconspicuous, light-brown, flattened-globoid, 128–175 by 95–115 μ ; ostiolar filaments short, up to 50–65 μ long, usually not projecting beyond the ostiole.

I. Aecia chiefly hypophyllous, gregarious in rounded or elongate groups, 6–8 mm. across, short-cupulate, 0.2–0.3 mm. in diameter; peridium yellowish, the margin erose; peridial cells oblong or rhombic, 20–26 by 29–35 μ , slightly overlapping, the outer wall 8–10 μ thick, finely transversely striate, the inner wall 4–6 μ thick, verrucose or slightly tuberculate; aeciospores globoid or broadly ellipsoid, 18–19 by 19–24 μ ; wall colorless, 1–1.5 μ thick, very closely and finely verrucose.

II. Uredinia amphigenous, scattered, round, 0.5–1 mm. across, tardily naked, cinnamon-brown, cinereous when covered, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 19–26 by 23–32 μ ; wall cinnamon-brown, 2–3 μ thick, moderately, very minutely, and obscurely echinulate, the pores 3–5, scattered.

III. Telia amphigenous, scattered, round, 0.2–1 mm. across, tardily naked, pulvinate, somewhat pulverulent, chestnut-brown, cinereous when covered, ruptured epidermis conspicuous; teliospores broadly and somewhat angularly ellipsoid, 18–26 by 30–42 μ , rounded at both ends, slightly or not constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, uniform or somewhat thickened into a hyaline papilla over germ-pore, smooth except for a few longitudinal lines of verrucose markings, the germ-pore of upper cell apical or occasionally displaced laterally, the pore of lower cell varying in position from near the pedicel to septum; pedicel colorless, deciduous.

ON PRIMULACEAE:

Dodecatheon alpinum (A. Gray) Greene, California.*Dodecatheon Jeffreyi* Moore, Alaska; British Columbia.*Dodecatheon Hendersoni leptophyllum* Suksd., Oregon.? *Dodecatheon tetrandrum* Suksd., Washington.TYPE LOCALITY: Mt. Eddy, Siskiyou County, California, on *Dodecatheon alpinum*.

DISTRIBUTION: From southeastern Alaska to southern California in the mountains.

EXSICCATI: Barth. N. Am. Ured. 554, 1457; Sydow, Ured. 1774.

194. *Dicaeoma Gentianae* (Strauss) Kuntze, Rev.Gen. 3³: 468. 1898.*Uredo Gentianae* Strauss, Ann. Wett. Ges. 2: 102. 1810.*Puccinia Gentianae* Link, in Willd. Sp. Pl. 6²: 73. 1825.*Uromyces Gentianae* Lév. Ann. Sci. Nat. III. 8: 371. 1847.

O. Pycnia amphigenous, few, scattered, punctiform, inconspicuous, honey-yellow becoming brownish, flask-shaped, 80–128 μ in diameter by 65–96 μ deep.

I. Aecia amphigenous and caulicolous, chiefly hypophyllous, gregarious, crowded in groups, sometimes covering the entire under surface of the leaf, cupulate, short, 0.3–0.5 mm. broad; peridium whitish, the margin slightly recurved, irregularly lacerate; peridial cells linear-rhomboidal, 15–19 by 24–29 μ , the outer wall about 3 μ thick, smooth, the inner wall thicker, 3–5 μ , closely verrucose; aeciospores angularly globoid or oblong, 13–19 by 16–24 μ ; wall pale lemon-yellow or colorless, irregular in thickness, 1–1.5 μ , closely and finely verrucose.

II. Uredinia mostly epiphyllous, numerous, scattered or grouped to form concentric circles 1.5–15 mm. in diameter, roundish or elliptic, about 0.5 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 19–24 by 24–29 μ ; wall golden- or cinnamon-brown, 1.5–2.5 μ thick, moderately or sparsely and evenly echinulate, the pores 2, sometimes 3, approximately equatorial.

III. Telia amphigenous, chiefly epiphyllous, scattered, roundish or often irregular, 0.5–1.5 mm. across, early naked, compact, pulvinate, blackish-brown, ruptured epidermis

conspicuous; teliospores ellipsoid, 21–27 by 31–42 μ , rounded above and below, slightly constricted at septum; wall cinnamon- or chestnut-brown, 2–3 μ thick, slightly thickened at apex, 3–7 μ ; pedicel hyaline, thin-walled, 1 μ or less, fragile, up to 40 μ long.

ON GENTIANACEAE:

Dasystephana affinis (Griseb.) Rydb. (*Gentiana affinis* Griseb.), Colorado, Montana, Nevada, North Dakota, Utah, Wyoming.

Dasystephana Andrewsii (Griseb.) Small (*Gentiana Andrewsii* Griseb.), Michigan, Minnesota, Nebraska, New York, Wisconsin; Ontario.

Dasystephana Bigelovii (A. Gray) Rydb. (*Gentiana Bigelovii* A. Gray), Colorado, New Mexico.

Dasystephana linearis (Fröl.) Britton (*Gentiana linearis* Fröl.), New York.

Dasystephana Menziesii (Griseb.) Arth. (*Gentiana Menziesii* Griseb.), California.

Dasystephana oregana (Engelm.) Rydb. (*Gentiana oregana* Engelm.), California, Idaho, Oregon, Washington.

Dasystephana Parryi (Engelm.) Rydb. (*Gentiana Parryi* Engelm.), Colorado, Idaho.

Dasystephana puberula (Michx.) Small (*Gentiana puberula* Michx.), Iowa, South Dakota.

Dasystephana Romanzovii (Ledeb.) Rydb. (*Gentiana frigida* A. Gray, *G. Romanzovii* Ledeb.), Alaska, Colorado.

Dasystephana spathacea (H.B.K.) Arth. (*Gentiana spathacea* H.B.K.), Hidalgo.

TYPE LOCALITY: Europe, on *Gentiana ciliata*.

DISTRIBUTION: From the Adirondack Mountains in New York westward to the Rocky Mountains, and from Montana and southeastern Alaska southward to Central Mexico; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 126, 127, 128; Krypt.-fl. Brand. Pilze 3: f. B40; Corda, Ic. Fung. 4: pl. 4, f. 55.

EXSICCATI: Barth. Fungi Columb. 2451, 2560, 2763, 3656, 4849; Barth. N. Am. Ured. 36, 142, 342, 2246; Brenckle, Fungi Dak. 415; Carleton, Ured. Am. 27; Clements, Crypt. Form. Colo. 136, 562; Ellis, N. Am. Fungi 1037; Ellis & Ev. Fungi Columb. 184; Ellis & Ev. N. Am. Fungi 2220; Garrett, Fungi Utah. 231; D. Griff. W. Am. Fungi 380; Sydow, Ured. 1978.

195. *Dicaeoma Convolvuli* (Pers.) Kuntze, Rev.

Gen. 3³: 468. 1898.

Uredo Betae Convolvuli Pers. Syn. Fung. 221. 1801.

Uredo Convolvuli Strauss, Ann. Wett. Ges. 2: 96. 1810.

Uredo sepium Spreng. Syst. 4: 577. 1827.

Puccinia Convolvuli Cast. Obs. 1: 16. 1842.

Uredo Calystegiae Desmaz. Ann. Sci. Nat. III. 8: 10. 1847.

Aecidium Calystegiae Cast.; Desmaz. Ann. Sci. Nat. III. 8: 14. 1847.

Aecidium Convolvulacearum Cesati; Klotzsch, Herb. Viv. Myc. 1492; hyponym. 1850.

Uromyces Calystegiae DeBary; Fuckel, Symb. Myc. 63. 1869.

Aecidium dubium G. W. Clinton; Peck, Rep. N. Y. State Mus. 27: 104. 1875.

Aecidiolum Convolvuli Sacc. Michelia 1: 12. 1877.

O. Pycnia epiphyllous, minute, gregarious, immersed, globoid or ovoid-globoid, 80–100 μ broad by 90–150 μ deep; ostiolar filaments free, 60–100 μ long.

I. Aecia hypophyllous, caulicolous, numerous, gregarious, crowded in groups 2–3.5 mm. across, hemispheric becoming cupulate when open, 0.2–0.4 mm. across; peridium whitish turning yellow, the margin fairly smooth and slightly recurved; peridial cells rhomboidal, 16–21 by 23–31 μ , slightly overlapping, the outer wall 3.5 μ thick, smooth, the inner wall 3–5 μ thick, verrucose; aeciospores angularly ellipsoid or globoid, 15–20 by 18–25 μ ; wall very light-yellow or colorless, 1–1.5 μ thick, finely and rather closely and inconspicuously verrucose.

II. Uredinia amphigenous, numerous, scattered, frequently grouped, irregular or roundish, 0.1–0.8 mm. across, early naked, pulverulent, brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 18–26 by 23–33 μ ; wall cinnamon-brown, 2–2.5 μ thick, moderately echinulate, the pores 3, equatorial or slightly above the equator.

III. Telia chiefly amphigenous, occasionally caulicolous, numerous, scattered or confluent, on stems in groups up to 2 cm. across, on leaves in groups considerably smaller, small punctiform or large irregular, 0.1–1.8 mm. across, rather tardily naked, compact, pulvinate, blackish-brown, ruptured epidermis noticeable; teliospores oblong, oblong-clavate or ellipsoid, 23–31 by 42–55 μ , obtuse or rounded or more or less attenuate above, rounded or slightly attenuate below, moderately constricted at septum; wall chestnut-brown, 2–3 μ thick, thickened up to 5–13 μ at apex, smooth; pedicel cinnamon-brown, persistent, thick, 7–10 μ , about 35 μ long.

ON CONVULVULACEAE:

Convolvulus arvensis L., Massachusetts.

Convolvulus atriplicifolius (Hallier f.) House (*C. nyctagineus* Greene), Oregon.

Convolvulus californicus Choisy (*C. subacaulis* Greene), California.

Convolvulus interior House, Nebraska.

Convolvulus malacophyllus Greene (*C. villosus* A. Gray), California.

Convolvulus occidentalis A. Gray, California.

Convolvulus purpuratus Greene (*C. californicus* A. Gray, *C. luteolus* A. Gray), California.

Convolvulus sepium L., Alabama, Delaware, District of Columbia, Illinois, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Jersey, New York, North Dakota, Ohio, Tennessee, Vermont, Virginia, West Virginia, Wisconsin; Quebec.

Convolvulus sepium pubescens (A. Gray) Fernald (*C. repens* L.), New Jersey.

Convolvulus Soldanella L., California.

TYPE LOCALITY: Europe, on *Convolvulus arvensis*.

DISTRIBUTION: Massachusetts to Alabama, and westward to the Rocky Mountains, and on the Pacific coast; also in northern Africa and Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2²: f. 234; Krypt.-fl. Brand. Pilze 3: f. B144.

EXSICCATI: Barth. Fungi Columb. 2354, 3934, 4355, 5056; Barth. N. Am. Ured. 427, 428, 936, 937, 1037, 1234, 1838, 2238, 2239; Carleton, Ured. Am. 11; Ellis, N. Am. Fungi 255, 1011; Ellis & Ev. Fungi Columb. 260, 551, 984, 1958, 2053; Ellis & Ev. N. Am. Fungi 1857, 3346; Seym. & Earle, Econ. Fungi 331a, b, 332a, b, 492; Sydow, Ured. 1171.

196. *Dicaeoma jalapense* (Holway) Arthur.

Aecidium jalapense Holway, Ann. Myc. 2: 392. 1904.

O. Pycnia epiphyllous, minute, gregarious, immersed, globoid or ovoid-globoid, 80–128 μ broad by 128–144 μ deep; ostiolar filaments free.

I. Aecia hypophyllous, crowded in groups of 1–6, cupulate, low; peridium whitish, darkening later, the margin erect, lacerate; peridial cells rhomboidal, 16–24 by 24–37 μ , overlapping somewhat the wall 4–6 μ thick, the outer smooth, the inner strongly verrucose; aeciospores globoid or angular, often resembling peridial cells in shape, 19–24 by 24–35 μ ; wall colorless, 4–6 μ thick, not uniform, closely and finely but distinctly verrucose.

II. Uredinia amphigenous, numerous, scattered, frequently seen in groups, irregular or roundish, up to 0.8 mm. across, rather early naked, pulverulent, brown, ruptured epidermis conspicuous; urediniospores globoid, ellipsoid or obovoid, 21–24 by 26–35 μ ; wall chestnut-brown, 2–3 μ thick, prominently echinulate, the spines 4–6 μ apart, the pores 3, equatorial.

III. Telia unknown.

ON CONVULVULACEAE:

Ipomoea Jalapa (L.) Pursh, Oaxaca.

TYPE LOCALITY: Jalapa, Mexico, on *Ipomoea Jalapa*.

DISTRIBUTION: Known only from the type locality.

EXSICCATI: Barth. N. Am. Ured. 1501.

197. *Dicaeoma Lithospermi* (Ellis & Kellerm.) Kuntze,

Rev. Gen. 3³: 469. 1898.

Puccinia Lithospermi Ellis & Kellerm. Jour. Myc. 1: 2. 1885.

O. Pycnia epiphyllous, crowded in small groups about 1 mm. in diameter on slightly yellowish spots, rather inconspicuous, honey-yellow becoming light-brown, globoid or flattened-globoid, 95–130 by 80–100 μ ; ostiolar filaments up to 55 μ long, usually somewhat agglutinated into a column.

I. Aecia chiefly hypophyllous, crowded in groups up to 2 mm. across, cupulate, punctiform, low, 0.1–0.2 mm. across; peridium whitish, the margin erect, denticulate; peridial cells rhomboidal, 15–19 by 16–29 μ , considerably overlapping, the outer wall 3–7 μ thick, smooth, the inner wall 3–5 μ thick, finely verrucose; aeciospores angularly globoid, 13–16 by 16–21 μ ; wall colorless, 1–1.5 μ thick, finely and inconspicuously verrucose.

II. Uredinia amphigenous and caulicolous, numerous, scattered, sometimes in circinating groups, 1–2 mm. in diameter, roundish or more often lenticular or linear, 0.4 mm. across, up to 1–2 mm. long, early naked, pulverulent, dark-brown, ruptured epidermis conspicuous; urediniospores globoid or obovoid, 18–21 by 21–26 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 2 or 3, usually 2, equatorial.

III. Telia amphigenous, not abundant, scattered, round, small, 0.2–0.5 mm. across, early naked, compact, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores elongate-ellipsoid or pyriform, 18–23 by 42–56 μ , rounded, truncate or usually attenuate above, strongly constricted at septum; wall chestnut-brown, 1.5–2 μ thick, thickened at apex

up to 7–15 μ , smooth; pedicel concolorous above, hyaline below, stout, 5–7 μ broad at point of attachment, tapering, as long as spore or longer, the wall thin.

ON CONVULVULACEAE:

Evolvulus nummularis L., Porto Rico.

Evolvulus Nuttallianus R. & S. (*E. pilosus* Nutt., *E. argenteus* Pursh), Colorado, Kansas, Nebraska, Texas.

Evolvulus sericeus Sw., Texas.

TYPE LOCALITY: Manhattan, Kansas, on "*Lithospermum canescens*," error for *Evolvulus Nuttallianus*.

DISTRIBUTION: Nebraska and Colorado southward to Texas and in Porto Rico; also in Japan.

EXSICCATI: Barth. Fungi Columb. 2962; Barth. N. Am. Ured. 45; Clements, Crypt. Form. Colo. 568; Ellis & Ev. Fungi Columb. 2151; Sydow, Ured. 2123.

198. *Dicaeoma Cressae* (DC.) Kuntze, Rev. Gen.

3³: 468. 1898.

Aecidium Cressae DC. Fl. Fr. 6: 89. 1815.

Puccinia Cressae Lagerh. Bol. Soc. Brot. 7: 131. 1889.

Puccinia cretica Holway, Erythea 5: 31. 1897.

O. Pycnia not seen.

I. Aecia hypophyllous, numerous, crowded, covering entire under surface of leaf, short-cylindric, 0.3–0.6 mm. across; peridium whitish, the margin erect, denticulate or somewhat lacerate; peridial cells rhomboidal, 20–30 by 32–42 μ , considerably overlapping, the outer and inner wall of about equal thickness, 7 μ ; aeciospores angularly globoid, 15–22 by 18–26 μ ; wall light-yellow or colorless, 1–1.5 μ thick, finely and inconspicuously verrucose.

II. Uredinia amphigenous, scattered, punctiform, roundish or irregular, up to 0.7 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores obovoid or pyriform, 19–23 by 27–33 μ ; wall golden-brown, 1.5–2 μ thick, moderately echinulate, the pores 2 or more often 3, equatorial.

III. Telia amphigenous, numerous, scattered, roundish or often irregular, 0.2–0.8 mm. across, early naked, compact, pulvinate, dark-brown, ruptured epidermis evident; teliospores ellipsoid or oblong-cylindric, 19–26 by 32–42 μ , rounded above and below, moderately constricted at septum; wall golden- or cinnamon-brown, 1.5–2.5 μ thick, rarely thickened at apex to 3 μ , smooth; pedicel fragile.

ON CONVULVULACEAE:

Cressa aphylla A. Heller, Texas.

Cressa depressa Goodding, Arizona, Utah.

Cressa erecta Rydb., Utah.

Cressa truxillensis H.B.K., California, Nevada, New Mexico, Texas; Lower California, Sonora.

TYPE LOCALITY: Pérauls, near Montpellier, France, on *Cressa cretica*.

DISTRIBUTION: Texas westward to Pacific coast, including portions of northern Mexico and southern Utah and Nevada; also in northern Africa and Europe.

EXSICCATI: Barth. N. Am. Ured. 1644, 1645; Garrett, Fungi Utah. 91, 158; Sydow, Fungi Exot. 24.

199. *Dicaeoma Giliae* (Hark.) Kuntze, Rev. Gen.

3³: 469. 1898.

Puccinia Giliae Hark. Bull. Calif. Acad. 1: 34. 1884.

O and I. Pycnia and aecia not seen.

II. Uredinia amphigenous, numerous, scattered or confluent in groups of two or three, roundish, 0.2–1.5 mm. in diameter, tardily naked, pulvinate, cinnamon- or chestnut-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 16–23 by 21–26 μ ; wall cinnamon-brown, 1.5–2.5 μ thick, finely and closely echinulate, the pores 2, equatorial.

III. Telia amphigenous, caulicolous, numerous, scattered or confluent in small groups, roundish or irregular, 0.2–1 mm. in diameter, rather tardily naked, pulvinate, compact, dark chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 18–23 by 35–58 μ , rounded or attenuate, occasionally truncate above, narrowed or rounded below, moderately constricted at septum; wall cinnamon-brown, darker at apex, 1.5–2.5 μ thick, thicker at apex, 7–10 μ , smooth; pedicel hyaline, thin-walled, two and a half to three times length of spore.

ON POLEMONIACEAE:

Collomia grandiflora (A. Gray) Dougl. (*Gilia grandiflora* A. Gray), California, Washington.

Gilia capitata Hook., California, Oregon.

Gilia filifolia Nutt., Arizona.

Gilia gilioides (Benth.) Greene (*Collomia gilioides* Benth.), California.

Gilia pinnatifida Nutt., Colorado.

Linanthus ciliatus (Benth.) Greene (*Gilia ciliata* Benth.), California.

Navarretia atractyloides H. & A., California.

Navarretia intertexta (Benth.) Hook., Oregon.

TYPE LOCALITY: Mt. Diablo, California, on leaves and bracts of *Gilia ciliata*.

DISTRIBUTION: Colorado and the Pacific coast of the United States.

EXSICCATI: Barth. Fungi Columb. 2960; Barth. N. Am. Ured. 37, 441, 1650; Ellis, N. Am. Fungi 1058; Sydow, Ured. 1127.

200. *Dicaeoma fumosum* (Holway) Arthur.

Puccinia fumosa Holway, Ann. Myc. 3: 23. 1905.

O. Pycnia not seen.

I. Aecia hypophyllous, closely clustered in rounded or irregular groups up to 5 mm. across, on larger light-yellow spots, cupulate, 0.1–0.2 mm. in diameter, low; peridium yellowish, often collapsed, the margin strongly recurved, denticulate; peridial cells rhomboidal in radial longitudinal section, 15–21 by 21–31 μ , overlapping, the outer wall thick, 5–9 μ , smooth, the inner wall thinner, 2.5–3.5 μ , moderately verrucose; aeciospores globoid or angular, 14–18 by 16–21 μ ; wall pale-yellow, thin, 1 μ , minutely verrucose, appearing almost smooth when wet.

II. Uredinia amphigenous, numerous, scattered, sometimes confluent in small groups, roundish, 0.1–0.6 mm. in diameter, tardily naked, bullate, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 16–22 by 21–28 μ ; wall cinnamon-brown, 1.5–2 μ thick, moderately and rather noticeably echinulate, the pores 2, equatorial.

III. Telia amphigenous, caulicolous, numerous, scattered or confluent in small groups, roundish or irregular, 0.1–0.4 mm. across, rather tardily naked, pulvinate, compact, blackish, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 16–21 by 37–52 μ , rounded or attenuate, sometimes truncate above, narrowed or rounded below, moderately constricted at septum; wall chestnut-brown, slightly lighter below, moderately thick, 1.5–2 μ , thicker at apex, 7–10 μ , smooth; pedicel hyaline, thin-walled, about 1 μ , about as long as spore.

ON POLEMONIACEAE:

Loeselia ciliata L., Jalisco, Morelos; Guatemala.

Loeselia coccinea G. Don, Hidalgo, Jalisco, Mexico (state).

Loeselia glandulosa G. Don, Chihuahua, Guerrero; Guatemala.

Loeselia sp., Oaxaca; Costa Rica.

TYPE LOCALITY: Iguala, Guerrero, Mexico, on *Loeselia glandulosa*.

DISTRIBUTION: Mexico and Central America.

EXSICCATI: Barth. N. Am. Ured. 1342; Sydow, Ured. 1977.

201. *Dicaeoma* (?) *Cryptanthus* (Dietel & Holway) Arthur.

Puccinia Cryptanthus Dietel & Holway; Dietel, Erythea 1: 249. 1893.

O and I. Pycnia and aecia unknown.

II. Uredinia caulicolous, scattered, oblong or linear, 0.5–2 mm. long, somewhat tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 19–26 by 23–29 μ ; wall golden-brown, 2–2.5 μ thick, closely and finely echinulate, the pores 2, approximately equatorial.

III. Telia caulicolous and hypophyllous, in groups 2–6 mm. across, oblong or linear, 0.2–6 mm. long, somewhat tardily naked, compact, pulvinate, blackish-brown, ruptured epidermis conspicuous; teliospores ellipsoid or obovoid, 16–29 by 32–58 μ , rounded above, rounded or somewhat narrowed below, somewhat constricted at septum; wall chestnut-brown, 1–2 μ thick, 5–10 μ at apex, smooth; pedicel colorless, 9 by 26–61 μ ; mesospores present.

ON BORAGINACEAE:

Cryptantha flaccida (A. Gray) Greene (*Krynitzkia oxycarya* A. Gray), California.

Cryptantha Torreyana (A. Gray) Greene (*Krynitzkia Torreyana* A. Gray), California, Washington.

TYPE LOCALITY: Camp Badger, California, on *Cryptantha Torreyana*.

DISTRIBUTION: Central California to southern Washington.

EXSICCATI: Barth. N. Am. Ured. 1235.

COMPLETED VOLUME

- 9 : i-iv, 1-542. (Agaricales:) Polyporaceae (pars), Boletaceae, Agaricaceae (pars). Complete in 7 parts.

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- 3¹: 1-88. Hypocreales: Nectriaceae, Hypocreaceae. Fimetariales: Chaetomiaceae, Fimetariaceae.
- 7¹: 1-82. Ustilaginales: Ustilaginaceae, Tilletiaceae. 7²: 83-160. Uredinales: Coleosporiaceae, Uredinaceae, Aecidiaceae (pars). 7³: 161-268. Aecidiaceae (pars). 7⁴: 269-336. Aecidiaceae (pars).
- 10¹: 1-76. (Agaricales:) Agaricaceae (pars). 10²: 77-144. Agaricaceae (pars). 10³: 145-226. Agaricaceae (pars).
- 15¹: 1-75. Sphagnales: Sphagnaceae. Andreaeales: Andreaeaceae. Bryales: Archidiaceae, Bruchiaceae, Ditrichaceae, Bryoxyphiaceae, Seligeriaceae. 15²: 77-166. Dicranaceae, Leucobryaceae.
- 16¹: 1-88. Ophioglossales: Ophioglossaceae. Marattiales: Marattiaceae. Filicales: Osmundaceae, Ceratopteridaceae, Schizaeaceae, Gleicheniaceae, Cyatheaceae (pars).
- 17¹: 1-98. Pandanales: Typhaceae, Sparganiaceae. Naiadales: Zannichelliaceae, Zosteraceae, Cymodoceaceae, Naiadaceae, Liliaceae. Alismales: Scheuchzeriaceae, Alismaceae, Butomaceae. Hydrocharitales: Elodeaceae, Hydrocharitaceae. Poales: Poaceae (pars). 17²: 99-196. Poaceae (pars). 17³: 197-288. Poaceae (pars).
- 21¹: 1-93. Chenopodiales: Chenopodiaceae. 21²: 95-169. Amaranthaceae. 21³: 171-254. Allioniaceae.
- 22¹: 1-80. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae. 22²: 81-192. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Pterostemonaceae, Hamamelidaceae, Altingiaceae, Phyllonomaceae. 22³: 193-292. Grossulariaceae, Platanaceae, Crossosomataceae, Connaraceae, Calycanthaceae, Rosaceae (pars). 22⁴: 293-388. Rosaceae (pars). 22⁵: 389-480. Rosaceae (pars). 22⁶: 481-560. Rosaceae (pars).
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- 25¹: 1-88. Geraniales: Geraniaceae, Oxalidaceae, Erythroxylaceae, Linaceae. 25²: 89-171. Tropaeolaceae, Balsaminaceae, Limnanthaceae, Koerberliniaceae, Zygophyllaceae, Malpighiaceae. 25³: 173-261. Rutaceae, Surianaceae, Simaroubaceae, Burseraceae.
- 29¹: 1-102. Ericales: Clethraceae, Monotropaceae, Lennoaceae, Pyrolaceae, Ericaceae.
- 32¹: 1-86. Rubiales: Rubiaceae (pars).
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